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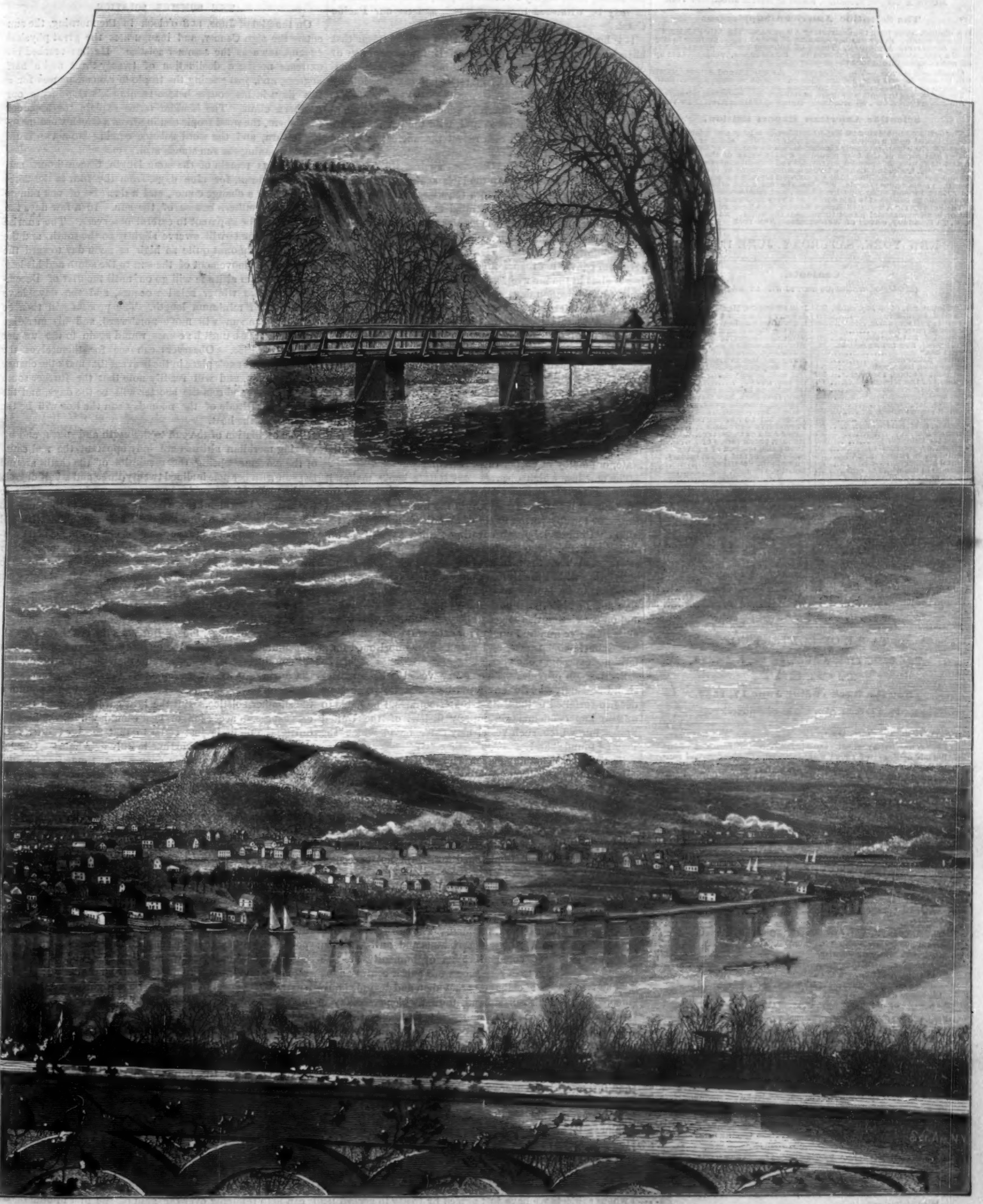

EAST ROCK PARK, NEW HAVEN.—VIEW FROM FAIR HAVEN HEIGHTS.

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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 887,

For the Week ending June 17, 1882.

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LEGISLATIVE ATAVISM.

While studying the variations of plants and animals under domestication and also in the state of nature, Darwin observed a tendency more or less persistent and active to revert to earlier and less specialized forms. Instead of exactly reproducing the parent in type and behavior the offspring would more closely resemble some ancestral form, perhaps far remote in time and in the scale of development. This reversion he called "atavism."

The same characteristic appears also among men; and the scientific historian finds in this "atavism" an explanation of those otherwise unaccountable outbursts of wild barbarism among partially civilized communities, as shown in relapses to the bloody rites of ancestral religions and the like; and of those equally unreasoning outbursts of race animosities among more highly civilized peoples; such, for example, as may be witnessed to-day in Russia and on our Pacific Coast.

It is largely through this national or local atavism that history repeats itself; and because of it the experience of one age or generation counts for nothing when a later generation relapses and insists upon repeating the old, it may be fatal experiment.

Under new and widely different conditions, the old phase of thought and feeling revives, and, with the passionate unreason of the earlier day, men repeat the ancient folly and re-enact the ancient injustice.

Compare the recent act of Congress against the immigration of Chinese laborers with the laws against free negroes enacted a few years ago by South Carolina and other States of the south and west. The parallel is discreditably close, and the disgrace of Congress is greater than that of the earlier legislators in that Congress in its unwarranted invasion of the dignity and inherent rights of all honest labor, acted less from conviction than from a contemptible fear of offending a class in the far west, whose votes may be needed on some future election day; a class whose moral and economical thinking exactly reproduces that of the earlier day, as exhibited in this typical provision of the Constitution of Oregon, to wit:

"No free negro or mulatto, not residing in this State at the time of the adoption of this Constitution, shall ever come, reside, or be within this State, or hold any real estate, or make any contract or maintain any suit therein; and the Legislative Assembly shall provide by penal laws for the removal, by public officers, of all such free negroes and mulattoes, and for their effectual exclusion from the State, and for the punishment of persons who shall bring them into the State, or employ or harbor them therein."

The new law which disgraces our statute books makes it unlawful (for the space of ten years from August next) for any Chinese laborer to come within the limits of the United States, or for any person to aid or abet them in coming; the words "Chinese laborer" covering skilled as well as unskilled workers. The law provides:

"(SEC. 2) That the master of any vessel who shall knowingly bring within the United States on such vessel, and land or permit to be landed, any Chinese laborer, from any foreign port or place, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine of not more than five hundred dollars for each and every such Chinese laborer so brought, and may be also imprisoned for a term not exceeding one year."

Section 10 provides "That every vessel whose master shall knowingly violate any provisions of this act shall be deemed forfeited to the United States, and shall be liable to seizure and condemnation in any district of the United States into which such vessel may enter or in which she may be found;" and

Section 11: "That any person who shall knowingly bring into or cause to be brought into the United States by land, or who shall knowingly aid or abet the same, or aid or abet the landing in the United States from any vessel of any Chinese person not lawfully entitled to enter the United States, shall be deemed guilty of a misdemeanor, and shall on conviction thereof, be fined in a sum not exceeding one thousand dollars, and imprisoned for a term not exceeding one year."

This would be an exact echo of the South Carolina law against the introduction of "free negroes or persons of color," if it only had a clause providing for the sale into slavery of the obnoxious Chinaman. The spirit is the same; and the excuses offered for so barbarous and anti-American an invasion of the common rights of humanity are substantially the same to-day as they were half a century ago.

The free person of color was of an alien and degraded race, incompetent of citizenship and unfit to blend socially or politically with the Caucasian. At the same time his presence was a source of social peril, in that it threatened the stability of the prevailing industrial system. The same charges are now brought against the Chinese, and with slighter grounds for justification. Southern society survives and thrives with the negro free; before the ten years' limitation of Chinese immigration ends it is safe to predict that the nation, as a whole, will discover that its hazard from Chinese labor is infinitely less than from the wrong done to all laboring men by allowing local clamor to secure the general ostracism of any class of honest laborers.

The national shame of this enactment arises not so much because it involves a breach of good faith with China, to whose subjects we have just agreed by treaty to accord "all the rights, privileges, immunities, and exemptions which are accorded to the citizens and subjects of the most favored nation," as because it legalizes a positive and offensive discrimination against certain laborers, skilled and unskilled, as laborers. It is not the Chinaman, but the Chinaman who works, who is to be excluded, and for whose exclusion the law was specially passed.

In the face of this national crime it is trivial to discuss the misrepresentations and specious pretexts which the advocates of the measure have put forth so variously to justify their position. If all that has been said against the Chinese were true, it would not justify Congress in thus nationalizing the temporary lapse of a portion of the Pacific Coast people from the national standard of impartial justice to all honest labor, irrespective of the color of the laborer; a standard which hitherto—at least since slavery was abolished—has been our crowning virtue as a nation.

THE SUMMER SOLSTICE.

On the 21st of June, at 8 o'clock in the morning, the sun enters the sign Cancer, and inaugurates the great physical epoch known as the summer solstice. He has reached his extreme northern declination of twenty-three and a half degrees, and, just grazing the tropic of cancer, pauses for a few days in his course before turning his steps from our northern clime. The familiar terms explain the apparent movement, the word tropic coming from a Greek word meaning to turn, and the word solstice coming from two Latin words meaning the sun stands still.

The days remain of the same length, fifteen hours and sixteen minutes, for nine days, from the 16th to the 25th. On the 26th a change comes, and a decrease of one minute marks the southern course of the sun. In a few days the change will be apparent to careful observers. The sunrise and sunset points will swerve slightly to the south, and the sun will not mount quite so high at noon-day toward the zenith. The movement of the sun to the south and his lessening meridian altitude will go on until the 21st of December, when the winter solstice occurs, and the days have reached their minimum length. The process will then be reversed; the sun will move northward, and his meridian altitude increase until he comes round again to the summer solstice of 1883. Observers can see for themselves the changes in the sun's place in the heavens that mark the change in the seasons, and will readily note that the further south the sun rises and sets the shorter will be the days, and the lower the altitude of the noon-day sun the less will be the intensity of the heat.

This oscillation of the sun to the north and south, and his varying meridian altitude are only apparent, the real cause of the movement being the revolution of the earth around the sun with her pole inclined twenty-three and a half degrees to the plane of her orbit, her seasons varying according to the manner in which her surface is presented to the sun. In the north temperate zone the sun's rays now shine with full force, and summer reigns supreme. The mornings and evenings mark his furthest progress northward, the noons show his highest meridian altitude, the evenings bear witness to the period when his beams linger longest above the western horizon after sunset.

It would seem as if our hottest days should occur about the 21st of June, when the sun's perpendicular rays fall upon this portion of the globe. But such is not the case. As midsummer approaches the quantity of heat received from the sun during the day is greater than the quantity of heat lost during the night, and there is therefore an increase of heat each day. The daily increase reaches its maximum at the summer solstice. But the heat garnered up by the process causes an accession of heat each day until the heat lost during the night is just equal to that received during the day. This happens some time in July or August. Our hottest weather for this reason occurs some time after the summer solstice, just as the hottest part of the day is some time after midday, and the coldest part of the night is toward morning.

There are four great time marks in the annual revolution of the earth, the vernal equinox, the summer solstice, the autumnal equinox, and the winter solstice. The summer solstice is the most interesting and suggestive of them all. It is, in our zone, the culminating point of solar power, the gala-day of the sovereign who holds in his hand the issues of life and death for every member of the human race. The earth rejoicing in verdure, the perfection of foliage, the brilliant flowers, the ripening fruits, bear witness to the fertilizing power of his benignant beams. Out-door life furnishes the conditions of enjoyment, and earth, air, and sky hold out separate allurements to increase the number of those who share in the general holiday. So delightful are the charms of midsummer that one longs to make them immortal, to hold back the sun in his course, and perpetuate the present conditions of his reign. But such are not the conditions of human life. The seasons come and go, swayed by an omnipotent hand; at the culminating point of solar intensity the picture changes, the supreme moment passes. Before the sun that rises on the 21st of June sinks below the horizon, his face will be turned from us, the earth will have traveled thousands of miles toward the regions of cold and darkness. A fraction of light will be lost from the longest day, a fraction of darkness will be added to the shortest night.

No one can help mourning over the loss of the first minute of daylight that follows this summer solstice. No one can help rejoicing over the gain of the first minute of daylight that follows the winter solstice.

On the 26th the decrease of one minute in the day's length

is recorded on the astronomical calendar. It is only a minute at first, but minutes will be piled upon minutes, as the earth rolls on, until the last of July, the day will be forty-seven minutes shorter than it was under the beams of the solstitial sun.

THE PREVAILING STRIKES.

During the past year the general advance in prices has increased the cost of living very materially; for the plainer food staples the increase will average fully one-third, perhaps more. Primarily this is chargeable to the severe and long continued drought of last summer, by which the products of our farms and gardens were seriously diminished. The advantage taken of the occasion by speculative holders of the leading articles of food—grain, meat, etc.—has played a secondary but not unimportant part in effecting the increase in prices. With the steady and serious lessening of the purchasing power of their wages there has naturally arisen among wage-earners a desire for an increase of pay to enable them to maintain something like their accustomed style of living.

In many of the minor industries the desires of the workmen have been, in part at least, gratified, and wages have been raised. In the larger industries, which had begun to feel more seriously the effects of the general diminution of industrial and financial prosperity, the demands of the laborers have been met by a general closing of doors, with the assurance that the works could better afford to lie idle than to pay the increased wages asked for.

This has been the case particularly in the iron and steel industries. Early in April the men in the iron and steel works of the great centers of these industries proposed a revision of the scale of wages, to take effect June 1. The manufacturers refused to grant it, and also to accept a modification of the first proposition. The amalgamated association of iron and steel workers accordingly ordered a general strike for the scale originally proposed, on the day above named, and the order was generally carried out. The association claims a membership of 80,000, embracing nearly all the skilled iron and steel workers in the country. It may be safe to estimate that when this great body of men stopped working, four or five times as many more workmen, in the same and in related industries, were thrown out of employment.

What the result will be it is impossible at this time to foresee. That the strike will prove wholly or generally advantageous to the strikers and those whose income has been stopped by their action is doubtful, judging from the general results of such conflicts, even when they end in compelling employers to concede the scale of wages demanded. It is the common fate of these great labor wars that they come too late to be largely profitable. The wave of industrial activity—the trade "boom," as it is popularly called—has usually culminated before the attendant rise in the price of everything but labor drives the wage earners to united action for a corresponding increase in wages. On a declining market, or one soon to decline, the temporarily excessive demand for the special manufacture having been substantially met, the manufacturers have the advantage and are in a better position to bear a suspension of work than the workers are.

It is to be noticed that, with one or two exceptions, the strikers have conducted themselves with commendable sobriety and a proper regard for the rights of others. There have been no riots; and, except at Chicago, no unlawful attempts to prevent the employment of non-union men.

MISREPRESENTATION AS A LEGISLATIVE INFLUENCE.

In urging upon the favor of the House the recently passed bill to encourage the infringement of the rights of patentees, its advocates repeatedly asserted that the bill had been unanimously approved by the patent committee, and had received the cordial sanction of the Commissioner of Patents.

The incorrectness of the latter assertion was sufficiently shown last week. We are now able to state that the former was not less inexact. A member of the committee, Mr. Jones, of New Jersey, writes us that he opposed the measure as strenuously as he could, insisting that it nullified all patents coming under its meaning; that it was retroactive, and that, in his opinion, it was unconstitutional; but the majority of the committee were against him.

The fact that there was one member of the Patent Committee thus opposed to the bill should have been sufficient to prevent its being pressed upon the House as a measure which had received the committee's unanimous approval. In a statement of that sort there was no room for a possible honest misunderstanding.

Diastase in the White of Eggs.

It is well known that malt contains a substance capable of converting starch into sugar, to which the name of diastase has been given. A substance resembling diastase has been discovered in the albumen of the egg, by F. Selmi, the original discoverer of ptomaines, or poisonous alkaloids, in dead bodies. Previous to his death, in August, 1881, he wrote the following letter to Ercolani:

Various consideration have induced me to assume that egg albumen contained a body that would change starch into sugar. In fact, I found that a filtered aqueous solution of albumen, when digested with a solution of soluble starch, induced this change very rapidly. This confirmed my suspicion, and I attempted to isolate this body from ordinary albumen. This I succeeded in doing by treating the albumen with three parts of water and precipitating the solution with a sufficient quantity of concentrated alcohol. The diastatic substance is in the soluble portion of it, as I was able to prove by experiments, by redissolving the albumen that had been precipitated, and making comparative experiments with that and with the substance that remained in solution after expelling the alcohol at a low temperature.

The existence of a diastatic substance in egg albumen is of great physiological importance, which may be stated as follows:

The albumen contains glucose, and the yolk of egg contains starch; the latter is changed into sugar when it reaches the albumen and is thus converted into nourishment.

Artificial Diastatic Ferment.—To make artificial diastase, *i. e.*, a combination of albuminoids with phosphates and other salts, the white of eggs is diluted with two or three parts of water, filtered, and decanted. The albumen is then precipitated by somewhat less than 100 c.c. of alcohol; the precipitate is collected on a filter, washed several times with water, and allowed to drain until gelatinous. It is then taken from the filter and stirred up with water, to which has been added some bibasic or monobasic phosphate of soda, then heated to boiling.

The coagulum formed is them separated fron the liquid· in case it resulted from treating it with bibasic phosphate it is neutralized with the monobasic phosphate. The solution contains an albuminoid substance which foams greatly when shaken up with air, and which converts starch into sugar at ordinary temperature.

Experiments were also made to ascertain the power which phosphate of soda alone possesses of producing sugar from starch. Comparative experiments with a solution that contained the same amount of phosphate as the albuminoid substance, proved that the saccharifying power of the latter is three times as great as that of the phosphate solution alone. Probably other salts would increase the action of this diastase.—*Chemiker Zeitung.*

Preservation of Rubber.

Every one who uses vulcanized rubber is aware that the articles made of it will, in a longer or shorter space of time, get hard and brittle, so as to be useless. Hempel has been investigating the cause of this hardening, and has come to the conclusion that it is due to the gradual evaporation of the solvents employed when vulcanizing it. He has been trying to find some method of either preventing this evaporation, or of replacing the solvent by some other one. In this he was quite successful. If the india-rubber was put directly into the solvent it always absorbed too much of it, but the object was attained by putting the article in an atmosphere saturated with the vapor of the solvent, rubber stoppers, tubing, etc., which is perfectly elastic, is protected and prevented from spoiling by putting it in a desiccator or large glass box, in which is an open vessel of ordinary kerosene.

Simply sealing hermetically in a glass vessel preserves india-rubber for a long time. It is totally useless to try to keep it in a wooden box. As far as practicable it is to be kept in the dark. Old rubber that has become hard is softened in a very short time by putting it in a vessel with vapors of bisulphide of carbon. The action of bisulphide is, however, too powerful if it lasts too long, hence it must be taken out and put in the vapor of kerosene afterward. This simple regenerative process does good service for hard stoppers; but tubing generally does not get fit to use again, as the little cracks and checks that form when it gets hard cannot be closed again.—*D. I. Z*

Dangers of Coal Gas.

Some old questions have lately been investigated anew by M. Pobek, of Breslau, with reference to the injurious elements of common coal gas. This investigator has examined gas both before and after combustion, in order to determine the causes of any deleterious effect which it may be found to produce. He finds the chief source of danger in unburnt gas to be carbonic oxide. In some cases where a stream of gas escaping from a leaky pipe traverses ground not previously saturated, it deposits the hydrocarburets which give gas its characteristic odor, and afterward diffuses in dwelling-houses without its presence being perceived. In such a case the danger of explosion is added to that of poisoning; although explosions are seldom caused in this way, because the definite proportions necessary to an explosive mixture are not present. M. Pobek insinuates, however, that poisoning may supervene even when explosion does not take place. When gas is burnt under unfavorable conditions, M. Pobek is of opinion that the most injurious result is the excess of moisture which is thereby produced. There is no analysis given of the particular description of gas that formed the subject of M. Pobek's experiments; they must, therefore, be taken in a very general sense.

Hygiene Among the Chinese.

The "Heathen Chinee" has not a few revilers who are ever ready to point to features in his social character which render him an undesirable neighbor. The medical officer of the State Board of Health of San Francisco has, however, something to say in favor of the Celestials. In his report lately presented to Congress he states that he never knew any disease or pestilence originating or spreading in the Chinese quarters of the city. He admits that they live quite close, and attributes their healthy condition and immunity from disease to their frugal life. "They eat to live, and do not live to eat. They are clean in their habits, and they drink no whisky. I have never seen a drunken Chinaman in my life. They consequently obtain a better resisting power to the attack of disease. They constantly wash themselves, and keep themselves and their clothes clean. The death-rate is greater among the whites than among the Chinese; greater with adult white people than with adult Chinamen. There have been no epidemics among them; and there has been less smallpox among them than among the whites, the ratio of population being allowed."

The Mungoose as a Rat Killer.

The introduction of the mungoose into Jamaica as a cure for the once formidable rat pest on the sugar plantations is said to have proved a notable success. The sugar rat is a huge white bellied fellow, measuring ten inches in length of body, his long tail adding ten inches more to his length. Formerly the damage done to the sugar plantations of the island by these rats amounted to something like half a million dollars a year, rising to a quarter of the crop in seasons of special ravages. About five years ago the mungoose, whose zeal as a snake and rat killer is well known, was imported from India. As a result the plague of rats has been greatly diminished, with a saving in sugar of not less than 25 tons of sugar on each estate. There is also saved the expense of rattage, formerly amounting to hundreds of dollars a year.

Iron and Steel Production in 1881.

THE report of the Secretary of the American Iron and Steel Association for 1881, just completed, gives the following summary of the year's work: Production of pig iron in net tons, 4,641,564, including 21,086 tons of spiegeleisen; production of all rolled iron, including nails and excluding rails, 2,155,346 tons; Bessemer steel rails, net tons, 1,330,302; open hearth steel rails, net tons, 25,217; iron and other rails, net tons, 488,581; production of iron and steel street rails included in above, 21,554; crucible steel ingots, net tons, 89,762; open hearth steel ingots, net tons, 146,946; Bessemer steel ingots, net tons, 1,539,157; blister and patent steel, net tons, 3,047. Production of all kinds of steel, net tons, 1,778, 912. Production of blooms from ore and pig iron, net tons, 84,606. Imports of iron and steel, $61,555,078. Imports of iron ore, gross tons, 782,887. Exports of iron and steel, $15,782,282. Production of Lake Superior iron ore, gross tons, 2,836,335; production of iron ore in Jersey, gross tons, 737,052. Total production of iron ore in census year 1880, net tons, 7,974,705.

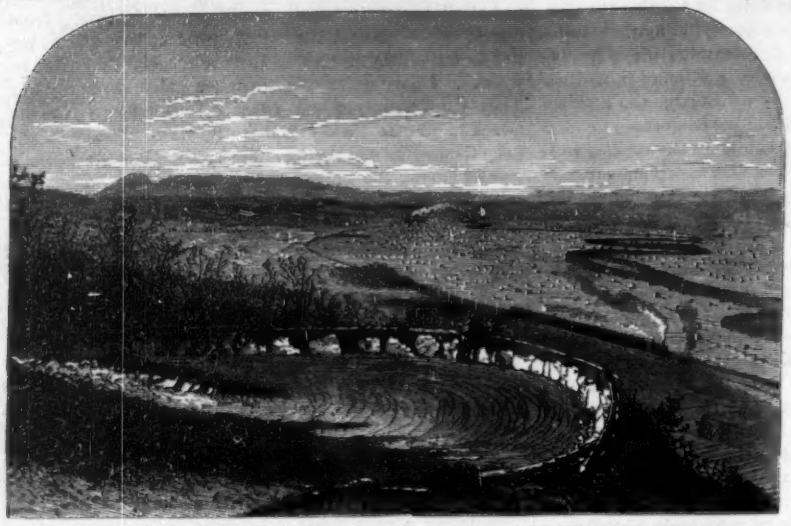
Production anthracite coal in census year 1880, net tons, 28,646,995. Production of bituminus coal in census year 1880, net tons, 42,420,581. Production of anthracite coal in 1881, gross tons, 28,500,016. Miles of railway completed in 1881: 9,650 miles of railway track in the United States, December 31, 1881, including double track and siding estimated, 130,000. Iron ships built in the United States in the fiscal year ending June 30, 1881, 42.

Flying Machines for War Uses.

GERMANY and Russia are both pushing forward experiments in flying machines for use in war or otherwise. It appears that the direction in which these are working is the only one likely to be successful. It ignores the ridiculous inflated gas-bag, which is enormous in size, difficult and costly to fill in war, and floats—a gigantic derelict—at the mercy of every current of air, a huge mark for the first gunner who can hit and bring it to the ground. Baumgarten, in Germany, and Baranovski, in Russia, adopt the principle of the inclined plane pressed against the air, and thus capable of making some attempt at least to regulate its own course. In the kite the force that presses the inclined plane is the hand of the boy acting through the string. In the sail of the boat the resistance of the water to sidelong motion keeps the sail pressed against the wind. In flying machines the pressure is given by an engine carried by the machine and acting by means of fans of one sort or the other. The difficulty at present is the weight of engine and fuel; but with the development of electrical practical knowledge we may fairly expect to see accumulators which will supply the maximum of power with the minimum of weight. Then the problem of flying in still air will be solved. Whether we shall ever be able to ride the storm is another matter.—*Pall Mall Gazette.*

For the Preservation of Wood.

A new wood preserving process has been invented in France by M Jacques. He first impregnates the timber thoroughly with a simple solution of soap, mixed with an acid—preferably phenic acid. This causes the fermentation, in a few days, within the wood, of a fatty acid, which is insoluble in water, and impregnates the remotest fibers. The reaction of the acid on the soap does not take place until a portion of the water has evaporated. It is claimed that more perfect impregnation can be had in this way than with creosote, and there is no danger of the washing out of the preservative from the exposed surfaces, as when sulphate of copper is used. The government commission on technical railroad operation in France is said to favor this process.—*The Metal Worker.*



VIEW FROM INDIAN HEAD, LOOKING TOWARD "SLEEPING GIANT."

EAST ROCK PARK, NEW HAVEN.

BY H. C. HOVEY.

A park once meant a royal or manorial inclosure, kept in its natural state for the preservation of game. It was for the aristocracy; and the common people had access, if at all, only by favor or by stealth. Ramparts and castles were not in harmony with pleasure grounds for peasants. The maxim was that "the common law does not encourage matter of pleasure, which brings no profit to the Commonwealth." Hyde Park was opened for overcrowded London by Charles I. about two hundred and fifty years ago, and the act was not imitated for a long period. Paris, with gay promenades, avenues, and gardens, had no real park of its own until, in 1852, the famous Bois de Boulogne, was changed from a royal hunting ground to a play-ground, and passed from the crown to the people. Parks have now multiplied on the Continent, and are among the most striking objects to which the tourist's attention is directed.

The early American colonists met nature daily in her wildest moods, yet showed their wisdom by laying out a green in every village and preserving public squares in the cities, the finest example being the Boston Common. At a later day there was rivalry as to ornamental cemeteries. Mount Auburn was consecrated in 1831; and then came Laurel Hill, Greenwood, and many another tasteful spot made attractive, aside from sacred associations. People visited these places for fresh air, and to see the grass and flowers, so unlike the walls of brick and stone amid which they daily lived. Gradually, however, the green mounds multiplied, monumental stones glistened at every turn, and the environment became better fitted for serious meditation than for light-hearted recreation.

Meanwhile the cities grew in size, the country seemed further off, its wildness was shorn away in the interests of manufacture and agriculture, public squares were only breathing holes, and cemeteries but poor play-grounds; and then, about thirty years ago, the people began to cry out for parks—a cry, it has been said, that is "a protest against civilization itself; the voice of the natural man refusing to be made into an artificial being." The answer to this popular demand may be seen in Central Park, in New York; Fairmount, in Philadelphia; Druid Park, in Baltimore; Eden Park, in Cincinnati, and many other places of public pleasure near the large cities, both at the East and at the West; and, grandest of all, the vast National Parks of the Yosemite, Mariposa, and Yellowstone.

The fact that the more busy people are, the more they feel the need of pleasant places to be idle in, has been nowhere more strongly exhibited than lately in Connecticut—that busy hive of manifold industries. Several causes have contributed, during the last decade, to promote rural improvement.

"How to Beautify and Build Up our Country Towns," was the title of a chapter in Secretary Northrop's report for 1869, followed by appeals for tree planting, systematic forestry, and the adornment of spots rich in natural charms or in historical associations.

Governor Hubbard called attention to the same subject in an annual message, taking as his text the gift to the town of Haddam, by members of the Field family, in 1878, of two extensive tracts of land laid out in walks and drives by Mr. Olmsted, the landscape gardener. At about the same time Roseland Park, in Woodstock, was planned by Mr. H. C. Bowen, whose aim it is to open to the public, in 1884, sixty acres arranged in the most tasteful order possible. More than fifty associations for rural improvement have been formed in the State, with marked and admirable results.

New Haven has long been proud of its handsome Green, laid out in 1638, as well as of other squares, and of the magnificent elms lining all its streets and gaining for it the name of the Elm City. The people thus favored were slow in waking up to the need of any extended park. When, at last, they did so, several plans had advocates; a favorite one being for a sea-side park, similar to the beautiful one at Bridgeport. After numerous petitions, hearings, and deliberations the East Rock Park was established, the charter being secured from the legislature early in 1880. When the plans of the commissioners are completed the natural features of this truly remarkable locality being improved by art, no city will have more delightful surroundings than this.

The first year has been mainly occupied in settling boundaries and endeavoring to get a title to the lands they include. The entire park, by official survey, covers an area of 370 acres, 140 of which are within the city limits, while 230 lie in the town of Hamden. The shape is quite irregular, as may be seen from the accompanying diagram copied from the map just made by the city engineer. Its extreme length is 7,000 feet, and its greatest breadth is about 4,000 feet. A search of the records showed these lands to be owned by 12 different parties, few of whom, however, had erected buildings. One of the land owners, Mr. John W. Bishop, donated 50 acres for park purposes. Yale College also gave about 23 acres, and other parties gave smaller lots. Individuals subscribed money to purchase the remainder, and the city has appropriated $30,000 to the same object, besides pledging an annual appropriation of $6,000 for improvements. Thus by gift or by purchase the city now owns nearly one-half of the 370 acres that are to be secured. The remainder will be had in due time.

VIEW FROM INDIAN HEAD, LOOKING TOWARD NEW HAVEN.

The park can be entered from several points. The western portion is accessible from Orange street and Whitney avenue. It contains groves, lawns, and meadows, and is intersected by Mill River, flowing from Lake Whitney down to the bay. The acreage suitable for use might be greatly increased by a system of dikes, or other means of drying the salt meadows. As matters now are, the tide, twice a day, sweeps over a considerable part of them.

A good driveway already exists entirely around the park, making a circuit of about four miles. Fair country roads enter the precincts from the Hamden side. A bridle path from the north leads out of the old Hartford turnpike, over grassy knolls, and then up through the bushes to the edge of the cliff overlooking Lake Whitney, and commanding a wide and delightful view. This is Whitney Peak, 300 feet above the sea, and wooded to its crest. It is one of four distinct peaks of the East Rock Range included within the park limits. The wilder portions of these hills have been seen by few of the 60,000 people living in the adjacent city; and when, in a recent lecture before the Sheffield Scientific School in New Haven, Professor S. E. Baldwin told the public what he had found in his rambles amid the rocks and glens, and his rough scrambles through laurel thickets, the story seemed as novel to most of his hearers as if he had been describing scenes in a foreign land!

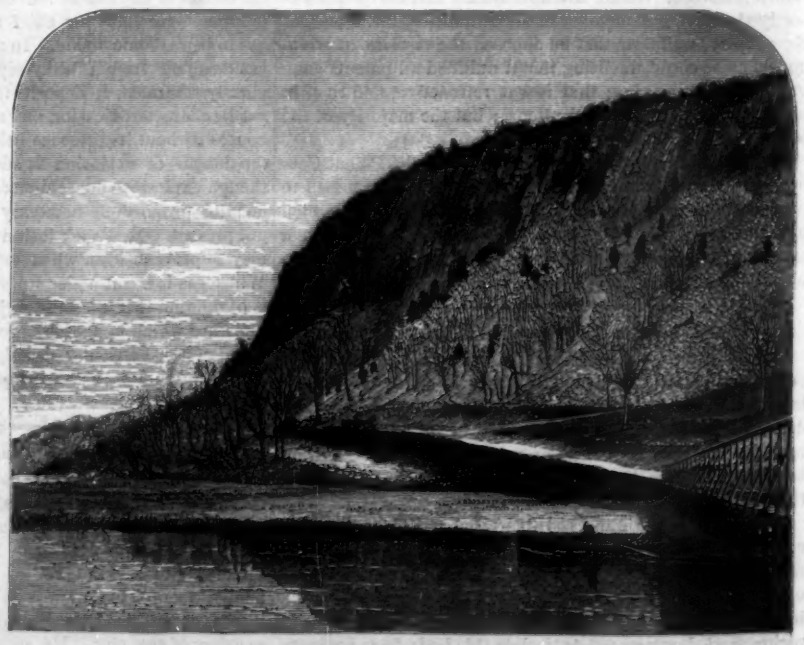
Snake Rock, the southern spur of the range, is easily climbed, being only 200 feet high, and having a wagon road nearly to the top. It would be regarded as a fine eminence were not others near that are so much more interesting.

The commissioners built a road last summer leading from "Bishop's Gate," on State street, to the summit of the next peak, called Indian Head, at a cost of $2,600; and the constant stream of visitors has amply justified the outlay. The ascent is by an easy grade—6 feet in 100—and where the road runs along steep declivities safety walls are built, and every precaution has been taken to guard against mishaps. Vistas have been opened through the forest at favorable points, each affording a different outlook on the meadows, rivers, valleys, and villages. Just before reaching the summit the road suddenly turns with a bold sweep, as represented by the artist, bringing before the spectator, in one wide panorama, the diversified scenes of which he has had only glimpses while making the ascent. Mount Carmel reposes on the north, 760 feet high, and slopes away in a long ridge, called, from a local fancy, "The Sleeping Giant," and the Hanging Hills of Meriden bound the horizon in another direction. The red brickyards and white steeples of North Haven are visible on the left; while on the right the pretty village of Montowese nestles at the foot of Peter's Rock. Farms, market gardens, and pleasant cottages are in the foreground; and beyond them the silvery Quinnipiac winds its way amid the countless haystacks of the Hamden meadows.

Indian Head is crowned by a natural grove of great beauty, which represents the chieftain's scalp lock. Between this and the precipitous brow of the hill is a fine esplanade, from which incumbrances have been cleared away. Immediately before us are the singular "ox-bows" of Mill River, cut from the meadows as it meanders under bridges, and amid warehouses and wharves to the broad harbor with its forest of masts.

On the left, beyond Snake Rock, appear the shining shell roads and embowered homes of Fair Haven, and along the farther shore of the Quinnipiac rise the Fair Haven Heights, crowned by elegant mansions, the finest of them built by retired oyster merchants. From no point does one get a better bird's eye view of the entire configuration of East Rock Park than from the crest of these heights. These attractive suburbs have lately been annexed to New Haven. The older portion of the city, with its stately buildings, its churches, and its college of world-wide fame, its long rows of shadowing elms, its factories and network of railways, may be seen on the right; while beyond are the villas around Savin Rock—that delightful seaside resort! And from these charming shores the blue water stretches away to the gray coast of Long Island, easily discernible on any fair day.

Indian Head, which is 310 feet high, is separated by a deep valley from East Rock, 350 feet above the sea, and the loftiest peak of the range. Next summer a road is to be constructed leading down into this valley by a circuitous way; but till that is done the prudent visitor will prefer to descend as he came, and approach East Rock either by View Street or by the wooden bridge near Cold Springs, leading from Orange Street. The rugged face of the huge rock shows to advantage from almost any point of view; but the loca-



EAST ROCK—VIEW FROM ORANGE STREET BRIDGE.

tion here selected for a sketch is in the vicinity of this old bridge. The base of the hill is concealed by a talus of *débris*, above which rises the colonnade of basaltic pillars, leaning at an angle of 28°, and reminding one of the Palisades of the Hudson, to which they are geologically related.

An old road winds up through the gorge to a quarry, whence for many years materials have been obtained for the foundations of most of the houses in the city, as well as for the Belgian and Telford pavements laid along the principal streets. Leaving the heaps of stone and shanties of the quarrymen, the road leads up to the summit, where stands "Stewart's Castle," the uncouth residence of the eccentric individual who still owns the Rock, guarding it by dog and gun, and only permitting the curious who may intrude upon his domain to look from the brink of the tall cliff on the payment of ten cents. The fee is small, and the view is beyond question the finest in the State; but the conditions spoil it for any except the most philosophical minds. The proprietor refuses to sell, saying that $100,000 would be no inducement to him to part with his acres, productive only in sprouts and paving stones; adding that if the commissioners condemn his lands he will defend his rights by the ablest legal counsel to be had in the country. The public are impatient to enjoy the unrivaled scenery, and willing to pay a fair price for the place; and the owner may hear some thing about the right of eminent domain before the year is over. Absurd as it may be, the man is actually building a steamboat on his premises; "having never read," as a commissioner remarks, "of Robinson Crusoe and his dug-out!"

These bold rocks, rising aloft from tide level, have served as landmarks ever since the Dutch adventurers coasted along hither from the New Netherlands, nearly 250 years ago. They called the locality "Red Mount," from the ruddy face of the rocks, and the name, in the modified form of Red Rock, still adheres to a bluff at the head of the harbor, at whose base a marine railway now lies where in colonial times the seals were wont to play.

An unsuccessful attempt was made, at a later day, to change the name of East Rock to "Sassacus," in honor of the Indian chieftain of that ilk, and to call West Rock "Regicide," in memory of the illustrious fugitives who long dwelt there in the "Judges' Cave." Professor Baldwin finds these names in Hillhouse's dramas:

> "See! how the guardian giants tower,
> Changing their aspects with the hour!
> There Sassacus in shade or glow,
> Hot with the noon or white with snow,
> Dark in the dawn, at evening red,
> Or rolling vapors round his head.
> In the soft West, as day declines,
> The Regicide, his rival, shines;
> Whose noble outline on the sky,
> Draws and detains th' enamored eye."

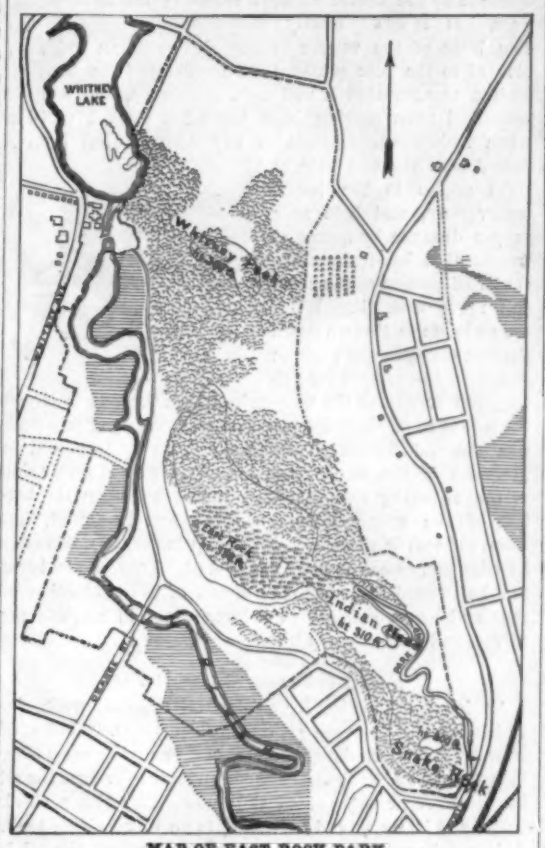
Seated on any peak in East Rock Park, on a summer's day, one may enjoy not only poetic but geologic musings, as he regards the jutting caps and proud cliffs, the meadows and the mountains. By the aid of a glass Mount Holyoke, 82 miles distant, may be seen; and we learn, from Professor Dana, that all the region between was once covered by the estuary of the Connecticut, whose main stream was afterward diverted to another channel, leaving only the Quinnipiac as its representative. This change was due to the ancient eruptions that left as relics these long ridges of trap, from 100 to 1,200 feet high, skirted by sandstone walls, hardened or crumbled, as the case may be, by the intense heat to which they were once exposed. The surface is scored by glacier marks, even to the tops of the highest hills, showing that the entire region was wrapped in a glacier blanket. When this came to be removed it was changed into a plow that strewed the valleys with bowlders and excavated basins, one of which, Lake Saltonstall, is 107 feet deep, though its surface is but 10 feet above the level of the adjacent Sound! Other basins are now filled to the brim with peat that has been pierced in places for 65 feet without striking the bottom.

At one time the region was lifted as much as 200 feet above its present level; and then great river beds were cut in what is now the floor of the Sound, emptying mighty volumes of fresh water into the Atlantic through two mouths, one at the Race and the other in Peconic Bay. The charts of the United States Coast Survey will enable one to trace, by the soundings, the course of those ancient rivers; and artesian wells, sunk in their channel, bring from below the brine an abundant supply of fresh water which is in daily use!

An elevation of 50 feet would sever the eastern portion of the Sound from the western; one of 100 feet would lay bare four-fifths of its bed; and one of 200 would dry it up all the way from Greenwich to New London. These facts explain how it happens that massive bowlders, like those of 1,000 tons weight that form the Judges' Cave on West Rock, also lie along the sandhills of Long Island; and they hint at the possibility that by some gentle lift of the earth's crust, hereafter, that famous island may become again what it formerly was, the southern shore of New England.

A Still Quicker Atlantic Passage.

The steamer Alaska, of the Guion line, has again beaten the record. She sailed from Queenstown eight minutes before twelve on the morning of May 14, and passed Sandy Hook bar at 11:40 A.M., May 21. Allowing for difference of time, the voyage occupied 7 days 4 hours 12 minutes. The daily distances were 428, 408, 419, 403, 423, 410, and 381 miles. On May 2 the Alaska completed the run to Queens-



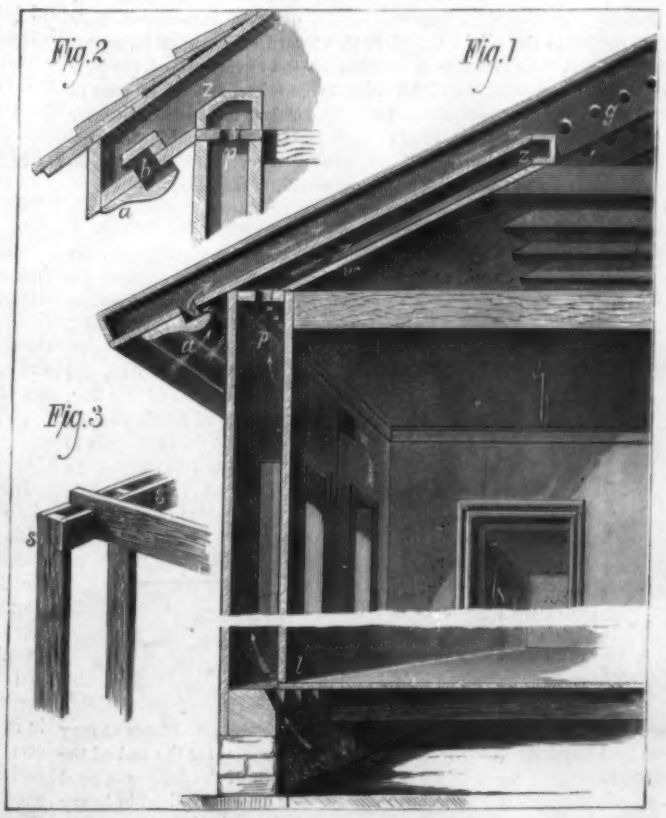
MAP OF EAST ROCK PARK.

town in 7 days and 26 minutes after leaving Sandy Hook. This was the fastest time ever made in crossing the ocean, but is so no longer. On the return trip the Alaska reached Fastnet (June 6) in 6 days 19 hours and 25 minutes from Sandy Hook. This is two hours better than her previous "best" eastward passage to the same point.

NEW VENTILATING SYSTEM.

We give an engraving of an improvement in the construction of buildings for the purpose of ventilation and for preventing snow from melting on the upper part of the house; for cooling the upper apartments, and for ventilating the cellar or lower portion.

The invention consists in a novel arrangement of perforated or slotted plancher and perforated end rafters, and in the connection therewith of air passages extending upward between the lath and plaster and the outside sheathing.



EATON'S VENTILATING SYSTEM.

In the accompanying engraving *a* is the plancher or under part of the cornice of the roof of a house. This projecting portion of the roof is built hollow, and the plancher is perforated around the entire building with holes or slots, *b*; or the plancher may be made of two boards laid side by side, with an aperture or space between them. The aperture or perforations are usually screened from view and shielded from the driving snow by means of a moulding having the upper rear corner rabbeted, thereby giving an L-shaped termination to the opening in the plancher. Through this aperture cold air is let into the upper part of the house, under the roof, along the under side of the eaves.

To obtain an outlet for the heated air and cause a good current, the outer or end rafters are perforated with slots or holes, *g*, which let the current of heated air enter the end or gable cornice, whence it finds exit at the peak through the holes in the plancher, already referred to. By the simple means described the roof of a house can be kept cool, so that the snow will melt thereon only during a rise of temperature outside of the house, and cannot therefore freeze at the edge of the roof and bank up. The current of air passing along under the roof can be greatly increased, and the cellar or space between the house and the ground thoroughly ventilated, removing dead air and preventing dampness in this way. The upper inside corners of the sills are beveled at intervals, forming passages, *l*, which allow the air from the cellar to ascend between the lath and plaster and the outside sheathing to the top of the wall of the house, where it passes through openings, *p*, and joins the current under the roof.

In constructions where a plate is used as a support for the rafters the openings, *p*, are made in the plate; but it is preferred to connect the tops of the studding by means of inside and outside boards, *s*, Fig. 3,) on which the rafters are designed to be rested. The opening between these boards affords a large and free passage for the air.

An additional beneficial effect of the construction is found in the rooms next the roof, these being rendered cool and pleasant in the heat of summer and preferable as sleeping apartments to the rooms below. The various apartments of the house may be ventilated through the devices described, suitable register openings being provided leading into the space between the studs behind the plaster. The air passes up through the openings in the plate or between the boards, *s*, at the top of the wall. If the wall is plastered no higher than this point, a horizontal box or conduit, *z*, is arranged over the openings, *p*, as shown in Fig. 2, and connected with the openings, so that the draught coming up between the studs which confine the room ventilation passes into the box, and is conveyed through an opening in the end rafter into the end cornice of the building, whence it passes out through the ventilating openings in the plancher. In this construction it will be seen that the side wall ventilation does not join the roof current until the cornice is reached, so that the warm air from the rooms cannot neutralize the effect of the cool current from the cornice under the roof, although the latter is improved thereby. If the house is plastered in the garret portion as high as the roof ties, the box or air conduit, *z*, is placed above the ties, and a flue, *w*, is constructed next the lath and plaster by means of a partition, the flue leading from the openings, *p*, at the top of the side wall to the conduit. This improvement was recently patented by Mr. P. G. Eaton, of Springville, Erie county, N. Y.

A Remarkable Gas Well.

The well finished in April last by the Niagara Oil Company, in Washington county, Pa., is one of the greatest gassers of modern drilling days. The sands found were not regular, nor as expected, neither did they appear to be oil-bearing. After a six months' struggle with the drill, a depth of 2,200 feet was reached, when a vein of gas was struck which threw the tools clear out of the hole, and more than fifty feet above the top of the derrick. The strength of the gas can be imagined when it is known that the tools weigh about 800 pounds. All work was then out of the question, as the gas made such a roaring noise that the drillers had to go away from the well fully 300 yards before being able to make themselves understood. The company have expended already more than $20,000, and have nothing to show for their money but leases of 60,000 acres of land and the great gas blower. The well is eight miles north of Washington, Pa., in Mt. Pleasant Township. It is just twenty-two miles from Pittsburg, and may be utilized by the latter city in case the supply does not become exhausted soon.—*Petroleum Age.*

A BRASS steam-whistle, thought to be the largest ever made, has just been finished by the Eaton, Cole & Burnham Co., 59 John St, New York. It is of cast brass, 4 ft. 9 in. in length, the bell having a diameter of 20 in. Its weight is 400 lb., and its value $500. The supply pipe is 4 in. in diameter. It goes to a large steam saw mill in Canada, where it is to be employed, with a system of signals, to give orders to the lumbermen at a distance, and to summon the widely scattered employes in case of fire.

Is Man the Highest Animal?*

The measure of zoological rank is the specialization exhibited by all the organs, taken collectively. Specialization may be exaggerated in one or several organs, without the animal therefore attaining as a whole a high rank. This is the case in man. The measure of specialization is afforded by embryology, which shows in earlier stages the simplicity and uniformity of structure, which in later stages is replaced by complexity. The human body preserves several important embryonic features. In man we find three series of high differentiations, namely: in the brain, in the changes induced by or accompanying the upright position, and third, in the apposibility of the thumbs to the other digits. These are the principal, though of course not strictly the only characteristics of man, which show that he is more specialized than any other animal. In other respects he shows a still more striking inferiority. It is of course a familiar observation that his senses are less acute than those of many animals—he has neither the keen vision of the falcon, nor the delicate scent of the dog. He is equally inferior in many structural features. His teeth are of a low mammalian type, as is shown both by his dental formula and by the presence of cusps upon the crowns of the teeth, a peculiarity of the lower mammalia, entirely lost in the horse, the elephant, and many other "brutes." His limbs show a similar inferiority, since they are little modified, preserving even the full number of five digits, and in respect of these members man stands therefore very low, lower than the cow and the pig. He plants the whole sole of his foot upon the ground, yet none except the lower mammalia, together with man and his immediate congeners, are plantigrade. So too with his stomach, which is so simple as compared with that of a ruminant, and indeed is of about the same grade as that of the carnivora. It makes, however, a still more forcible impression to learn that the human face, which we admire when withdrawn under a high intellectual forehead, is perhaps the most remarkable of all the indices that point out man's inferiority. In the mammalian embryo the face is formed under the fore brain or cerebral hemispheres. In our faces the fœtal disposition is permanently retained, with changes, which when greatest are still inconsiderable. In quadrupeds the facial region acquires a prominent development leading to the specialization of the jaws and surrounding parts, which brings the face to a condition much higher than that of the fœtus. Hence the projecting snout is a higher structure than the retreating human face. These facts have long been familiar to anatomists, but I am not aware that the inferiority of the human to the brute countenance has heretofore been considered a scientific conclusion by any one. Yet that inferiority is incontrovertible and almost self-evident.

The preceding statements render it clear to the reason that man is not in all respects the highest animal—and that it is a prejudice of ignorance that assumes that the specialization of the brain marks man as above all animals in the zoological system. It does give him a supremacy by his greater power of self-maintenance in the struggle of the world, but that has nothing whatever to do with his morphological rank. There is nothing in morphology that anywise justifies assigning, as is actually done, an almost infinitely greater systematic value to the specialization of the brain and a specialization of the limbs, stomach, teeth, face, etc., hence it is impossible to call man even the highest mammal. It is also doubtful whether mammals would be regarded as the highest class of the animal kingdom, were they not our nearest relatives. Let us beware of claiming to be the head of organic creation, since the Carnivora and Ungulata are in many respects higher than we. I believe that it is just as unscientific to call any one animal species the highest, as to pitch upon any one plant to stand at the head of the vegetable kingdom.—*C. S. Minot.*

Cures for Baldness.

The *Chemists' Journal* says: Dr. Xavier Landerer, of Athens, has again been so obliging as to send us some notes from the cradle of pharmacy.

Numberless remedies for baldness of French, English, German, and American origin stock our markets, but none, according to Dr. Landerer, equal in efficiency the following, which he has used and prescribed for many years past. Prepare a tincture of the cups of the *Quercus ægilops*, which are known in commerce as valonia, and digest with it powdered cloves and cinnamon. Make a tincture by digesting the leaves of the *Laurus apollonis* in acid wine, and mix the two together. Before applying this remedy the skin of the head should be well washed with a decoction of saponaria root (*Saponaria levantica*), to cure any *exanthema pityriatis* which may be present. Instead of pomatum or hair oil, laurel oil should be used, this being the usual hair oil in vogue among the ladies of the East. Dr. Landerer calls this remedy for baldness *alexitrichon*, or hair preserver.

Simultaneous Telegraphic and Telephonic Messages.

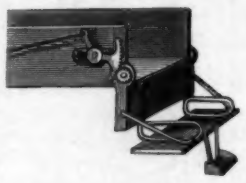
The French Minister of Posts and Telegraphs is reported to have received in Paris, from Brussels, May 21, a telegram of 53 words, and a telephonic dispatch of 110 words, simultaneously over one wire. The system employed is the discovery of Mr. Van Kisselberghe, Director of the Belgian Meteorological Bureau. It is said that the practical advantages of this invention are estimated by the French and Belgian Governments as of the utmost importance. The distance from Brussels to Paris is about 200 miles.

* Read before the American Association for the Advancement of Science, Cincinnati meeting, August, 1881.

MISCELLANEOUS INVENTIONS.

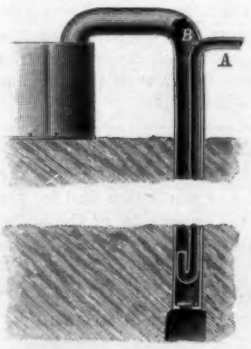
Step for Vehicles.

Mr. Asa K. Owen, of Tennessee, McDonough county, Ill., has patented an improvement in seats, end gates, and steps of vehicles, by which increased facility and safety are afforded passengers in getting in and out while they are less liable to be soiled by mud. The device may be operated by the driver without releasing his hold of the lines. It is quite clearly shown in the annexed cut. The body of the vehicle is provided with an end gate, pivoted to the rear portions of the sides of the body in such a manner that it will open downward, but will be restrained from moving back beyond a vertical position when it is open. A seat of any desired kind is connected with the end gate at right angles to the latter, transversely, and held at a proper distance by means of frames that have the same center of motion as the gate, and move with it. When the end gate is thrown down the seat occupies the position of a step, and is used for getting into or out of the wagon; but when the gate is closed the seat is in position for use as a seat. When in this position the end frames of the seat rest on cleats placed on the sides of the wagon body. Hinged to the under side of the swinging seat is a step that, bears upon the bottom of the wagon body when the seat is closed, but when the seat is thrown back the step is turned down over its edge and comes near to the ground. This gate and seat can be opened and closed by means of a combination of rods and levers attached to a lever placed in reach of the driver, and controlled by him.



An Ejector for Oil Wells.

An improved device for raising oil from oil wells, for which a patent has been granted to William O. Robbins, of New York city, is shown in the accompanying engraving, in which B is a pipe extending downward to or near the oil in the well, and is provided at its lower end with a check valve, and its upper end extending to an oil receiving tank. A is a tube entering the pipe, B, through which the oil is raised, at or near its upper end, and extends down to near the bottom of the pipe, and at this point is bent so as to extend upward for a short distance, leaving the end of the tube a short distance above the bend and facing upward. The upper end of this tube is connected with an air compressor or a reservoir for compressed air, whereby air under pressure will be forced through the tube and emitted from its lower end. This compressed air forces the oil in the pipe, B, upward and out of its upper end, thus creating a vacuum at the lower end of the pipe and causing the check valve to be raised and oil to pass in to fill the vacuum. This ejector has an advantage over other ejectors in the fact that it may be placed in the pipe of the well the same as a sucker rod, and requires no changes in lower or pumping section before it is applied.



Button Hole Attachment for Sewing Machines.

Mr. John K. Harris, of Springfield, Clarke county, O., has patented an improvement in the button hole attachment for sewing machines, for which he was granted a patent September 6, 1881, No. 246,764. The general method of making a button hole therein described is to make a series of short stitches in the cloth, upon one side of the center line, and then, after shifting the cloth laterally at the end of this line, to reverse the feed and make another series of stitches on the other side of the center line, which line is then cut open to form the button hole. But in this method of working a button hole the ends are not stayed or tied as substantially as hand-worked holes, and they are more liable to tear. In the improved attachment, by means of properly arranged devices of which we are unable to give a full description in our limited space the cloth when it is stitched along the line to the end of the button hole, is carried forward and backward across the end of the hole either in straight or curved lines as may be desired, making a perfect stay or tie for the end of the hole. Also, by a proper manipulation of the devices, a good substantial eyelet button hole, such as is required in heavy woolen goods, may be made, and also a single eyelet may be worked without the parallel portion of the button hole. The device is shown in the accompanying engraving.

Perspective Delineator.

An invention by which accurate perspective drawings can be rapidly and conveniently made, has recently been patented by Mr. Girard M. Perk Van Lith, of New York city. A box of suitable size is provided with a cover which consists of glass set in a frame hinged to the box. The hinges are fitted with stop lugs that allow the cover to be opened to a right angled position, but no further, and a brace that is pivoted to the box is then raised against the frame, and it is securely held in position. A slide is fitted for vertical movement in a socket piece at the front of the box, and may be adjusted to any height desired, where it is retained by a set screw. The box is placed on a suitable stand with the cover raised, and the eyepiece adjusted according to the distance of the object. The operator then closing one eye, applies the other to the eyepiece, and then traces the outlines of the object seen through the glass, on its inner surface, with a soft lead pencil. By tracing afterward on the outside of the glass with a copying liquid all the lines already marked on the inside, and placing a dampened drawing paper over these lines and rubbing slightly with the hand over the back of the paper, a correct perspective sketch from nature appears on the paper.

Detachable Handle for Teacups, etc.

Among the recently patented novelties we find a detachable handle for teacups, invented by Mr. John W. Davis, of Marion, Marion county, S. C. The handle may be of a strip or narrow plate of spring metal, but it is preferred to make it of a single piece of spring wire, which may be plated with gold, silver, or nickel, if desired. The handle is made of two strands to give it sufficient width to prevent turning sideways on the cup. The handle is bent so that the prongs that pass over the edge and inside the cup extend outwardly from each other at their ends to prevent the handle from turning laterally on the cup. These prongs and the handle on the outside of the cup are formed so that when the thickness of the cup is passed between them, the elasticity of the metal of the handle will cause it to be held with sufficient firmness for safe handling of the vessel and its contents. This handle is cheap, ornamental, and durable, and gives to plain cups all the advantages of those that have permanent handles, and at less expense, and they are not liable to be broken off.

Protection to Inventors.

In the Senate, May 19, Mr. Call submitted the following resolution, which was ordered to lie on the table and be printed:

Resolved, That the just exercise of the power granted to Congress in Section 8, Article 1, of the Constitution, "To promote the progress of science and useful arts, by securing for limited time to authors and inventors the exclusive right to their respective writings and discoveries," requires such amendment of the laws as will secure to the people of all the States and Territories, without prejudice because of any conditions of poverty, equal rights and equal opportunity in the beneficial use of their inventions and discoveries, and to reasonable compensation for the time, labor, skill, and knowledge applied and expended in making and improving such inventions.

That it is referred to the Committee on Patents to consider the subject, and to report a bill to the Senate which shall provide either for an extension of patents, or for the commencement of the life of a patent at the period of its successful introduction into public use, or for a royalty on such invention diminishing gradually, and with the amount realized from it, or otherwise providing relief or protection where new and useful inventions have been, or shall be made by persons whose poverty and limited means have deprived them of the beneficial use of the right to the said invention, or from obtaining a reasonable compensation from the same; also providing adequate protection to the people against excessive charges or vexatious suits, or against the exclusive right to inventions, as an oppressive monopoly.

It might be useful in this connection to have an authoritative definition of "oppressive monopoly," as applied to patent rights. Seeing that the inventor takes from the public nothing which it previously enjoyed, but simply offers for a consideration something new, something which may be declined and dispensed with if the price is excessive, the phrase, "the use of the exclusive right to inventors as an oppressive monopoly," seems to us to be simply a contradiction in terms.

Immigration and Wages.

Discussing the enormous ability of this country in providing occupation for larger and larger bodies of laborers without risk of a surfeit in the labor market, the Boston *Commercial Bulletin* points out that while the population of the United States has increased nearly 25,000,000 since 1860, about 6,000,000 of the number being immigrants, the diversity of our industries, made possible by a protective tariff, has absorbed the increase with ease, and has not been satisfied. This is evident from the fact that while the cost of the necessaries of life, both food and clothing, is no higher, and in most cases, is lower now than then (excepting, of course, certain brief abnormal periods), wages in both agricultural and manufacturing pursuits are everywhere higher, and a good deal higher. The wages of woolen mill operatives average 40 per cent higher in 1882 than in 1860; those of cotton mill operatives about 35 per cent higher; of mechanics in wood and iron about twenty-five per cent higher. Farmers in the west are getting more for their produce than they did in 1860, although the consumer pays less now than then; this is due to the improvements in and decrease in the cost of transportation. Wages paid by farmers are about 30 per cent higher now than then.

Correspondence.

The Patent Bill now before the Senate.

To the Editor of the Scientific American:

It is said that a portion, at least, of the Senate Committee on Patents will report adversely on the H. R. bill No. 6,018—which aims to deprive patentees of remedy against "the user of any patented article or device that has been purchased for a valuable consideration in the open market"—but that the measure will, nevertheless, probably pass the Senate under the same pressure which got it through the House. Different opinions seem to be entertained of the working of this measure, should it become a law. To the "Granger" and kindred organizations that have been instrumental in its origination and passage, and whose political influence it is intended to propitiate, it is supposed to seem the embodiment of legislative wisdom. These worthy citizens who are accustomed to exact the last penny for the usufructs of *their* special skill or industry may, possibly, not find the provision as plain sailing as they anticipate. For example, even admitting that the clause codicils all previous legislation which it contravenes, can the law be made to operate retrospectively? Can Congress abridge franchises already granted? See 4,884 Revised Statutes. Will then the contemplated statute—in effect—create two classes of patents, viz., those granted before and those granted after its passage? Will it or not be held conformable to the constitutional clause which says, "Congress shall have power . . . to promote the progress of science and useful arts, by securing for limited times to authors and inventors the EXCLUSIVE RIGHT to their respective writings and discoveries."

For advocates of "the progress of science and useful arts," whether inventors or not, the occasion seems opportune to memorialize Congress, and, if need arise, the Executive, against precipitate action. Fairness and public expediency alike demand that the creators of conveniencies and their representatives be given a hearing in committee.

GEORGE H. KNIGHT.

Cincinnati, O., June 6, 1882.

Clearing the Channel of the Mississippi.

To the Editor of the Scientific American:

I have read in your issue of the 3d, an article signed "Rufus Porter," in relation to clearing the channel of the Mississippi River by means of one thousand miles of endless chains, run by as many windmills in mile sections, which he states would not cost over one million five hundred thousand dollars. Would it not be a far cheaper plan for the government to subsidize the Mississippi River steamers, etc., to drag disk chains after them when going down stream, and in that way keeping the sedimentary deposits constantly agitated, or in a state of semi-solution which following vessels would work over a wider range, and serving the desired purpose in a much better way, and moreover costing nothing for the maintenance of machinery, manual labor, etc.?

It strikes the writer, in his humble opinion, to be the most feasible way, costing little for experiment, with the probability of good results.

S. P. C.

Richmond, Va., June 4, 1882.

Standard Time for the World.

At one of the sessions of the American Society of Civil Engineers in Washington, May 17, a report on standard time was presented by Mr. Sanford Fleming, chairman of a committee appointed to investigate the subject at a meeting of the society in Montreal last year.

In response to the request of the society, at its meeting in January, the committee has submitted to a large number of persons directly interested in the matter, the following scheme for the establishment of a prime meridian, and a uniform standard of time, with a series of questions to which replies were requested. To these questions some hundreds of replies were returned, 97 per cent of the writers approving of the scheme, and 93 per cent favoring a numbering of the hours from 1 to 24 consecutively.

The scheme under discussion proposes:

First—To establish one universal standard time, common to all peoples throughout the world, for the use of railways, telegraphs, and steamboats, for the purposes of trade and commerce, for general scientific observations, and for every ordinary local purpose.

Second—It is proposed that standard time everywhere shall be based on the one unit measure of time denoted by the diurnal revolution of the earth as determined by the mean solar passage at one particular meridian to be selected as a time zero.

Third—The time zero to coincide with the initial or prime meridian to be common to all nations for computing terrestrial longitude.

Fourth—The time zero and prime meridian of the world to be established with the concurrence of civilized nations generally.

Fifth—For the purpose of regulating time everywhere it is proposed that the unit measure, determined as above, shall be divided into 24 equal parts, and that these parts shall be defined by standard time meridians established around the globe, 15° of longitude, or one hour distant from each other.

Sixth—It is proposed that standard time shall be determined and disseminated under governmental authority; that time signal stations be established at important centers for the purpose of disseminating correct time with precision, and that all the railway and local public clocks be controlled electrically from the public time station, or otherwise kept in perfect agreement.

Seventh—The adoption of the system in the United States and Canada would, exclusive of Newfoundland and Alaska, have the effect of reducing the standards of time to four. These four standards, precisely one hour apart, would govern the time of the whole country, each would have the simplest possible relation to the other, and all would have equally simple relations to the other standards of the world.

Finally—It is proposed to have only one series of hours in the day, extending from midnight to midnight, and numbering from 1 to 24 without interruption, to number the hours between midnight and noon (1 to 12) precisely as at present, and to denote the hours between noon and midnight by letters of the alphabet.

The society adopted resolutions requesting Congress to take the initiative step toward establishing a time system on the basis of this scheme, by endeavoring to establish a prime meridian which shall be common to all nations.

The Iron Mountain at Durango, Mexico.

The Iron Mountain at Durango, Mexico, is described by Mr. John Birkbine, of Philadelphia, engineer of the company formed to develop its riches, as a hill one mile long, a third of a mile wide, and from four to six hundred feet in height above the plateau. The surface of the mountain exposing ore so as to be classified as good mining land aggregates over 10,000,000 square feet. There are indications that the deposit extends beneath the level of the plateau. Mr. Birkbine says that he spent considerable time in examining the mountain; and though most of the surface shows ore he does not agree with those who pronounce the mountain a solid mass of ore. He is rather inclined to think that the mountain is formed of one or more immense veins of specular iron ore, standing nearly vertical, the fragments of which have, by the action of the elements for ages, been thrown down to form the slopes of the mountain as a talus; but the extent of this detrital ore is too great to permit of locating any foot or hanging walls.

An analysis of an average of twenty-seven samples of ore from various parts of the mountain showed:

Magnetic oxide of iron	2·071
Ferric oxide	77·571
Manganic oxide	0·113
Titanic acid	0·710
Lime	5·050
Magnesia	0·364
Sulphuric acid	0·212
Phosphoric acid	3·041
Loss on ignition—water, etc	1·984
Silica	7·760
Alumina, etc., undetermined	1·124
	100·000
Metallic iron	55·800
Manganese	0·079
Sulphur	0·085
Phosphorus	1·328
Phosphorus in 100 parts iron	2·379

Selected samples, representing about seven-tenths of the area of the mountain, yielded nearly 63 per cent of iron.

Coal-Breaking with Lime.

Two or three years ago, a Scotch inventor devised a system of compressed-air blasting for use in coal-mines, where the out-flow of gas made the use of powder-blasts hazardous. At a recent meeting of the Iron and Steel Institute a much simpler mode of obviating the use of powder was described by a Mr. Mosley. In this system, the steam generated by the contact of water with caustic lime is the explosive agent. After the cartridge of caustic lime is placed in the shot-hole and tamped, water is forced in by a small force-pump, and the coal is broken by the slow pressure of the steam. The system is said to be rapid in its operation, and entirely safe.

Crystals.

Most of the metals assume, under certain conditions, a crystalline form, and those particularly which are found native occur frequently as crystals. The Latrobe nugget, at present in the Natural History Museum, is a magnificent instance of crystals of gold. It consists of natural golden cubes, welded, as it were, together in one mass. Among the metals, bismuth is remarkable for its tendency to crystallize, and by following the directions given, a crystalline mass of bismuth is readily obtained. Take about a quarter of a pound of the commercial metal and melt it either in a small clean iron ladle or over a Bunsen lamp in a porcelain crucible; when quite melted, set the ladle or crucible on a cold metal surface. Let it remain perfectly still, and watch the bismuth carefully, until it is seen to solidify round the edges, then quickly pour out the metal still remaining liquid, and you have the whole of the interior lined with more or less perfect cubical crystals of bismuth. There is one striking peculiarity about these crystals, however. They are but skeleton crystals; the lines forming the edges of the cubes are there, but there is a depression in each face of the crystal evidently not as yet filled up. The growth of the crystal was arrested by pouring out the still liquid metal, and there we have not only shown us the shape of bismuth crystals, but also the manner in which the crystal grows.

For purposes of comparison, try now to make sulphur crystals. To do this, melt down roll sulphur in the ladle or crucible, using, however, a very gentle heat, and not prolonging it beyond the point at which the whole of the sulphur is melted; allow to cool in the same manner as with bismuth, wait until a crust has formed over the surface, and then immediately bore two holes through with a red-hot wire, the one for the liquid sulphur to run out, and the other to admit air. Pour out the sulphur still remaining liquid, and cut carefully round the upper crust with a penknife, remove it, and the whole of the interior is interlaced with delicate needle-shaped, amber-like, crystals of sulphur. Here, then, are two substances, of widely different appearance and properties, both possessing in common this property of crystallizing, but with each there is a definite shape. Further experiment and observation teach us that the form of a crystal is as characteristic of a body as any other property it possesses. In the next paper the writer proposes to give further directions for the preparation of crystals, and hopes to add sketches of crystals as viewed by the microscope.—*W. Jago, in Knowledge.*

General J. G. Barnard.

Brevet Major-General John Gross Barnard, Corps of Engineers, U. S. A., died at Detroit, Mich., May 14. He was born at Sheffield, Mass., May 19, 1815. He was graduated at the Military Academy in 1833. He served as captain in the Mexican war. He was a member of the Tehuantepec Survey Commission, in 1850, assisting in the preparation of the first full report to the government concerning the Isthmus. In 1854 he was in charge of the construction of the fortifications at San Francisco, and in 1855–56 he was superintendent of the Military Academy. From 1856 to 1861 he was in charge of the fortifications of New York Harbor. He was present at the first battle of Bull Run as chief engineer on General McDowell's staff. In the same year, 1861, he was made a brigadier-general of volunteers. General Barnard directed the siege operations of the Army of the Potomac during the Peninsular campaign, and was afterward placed in charge of the defenses of Washington. In 1864–65 he served with General Grant as chief engineer of the armies in the field, and was present at the surrender of General Lee. He was made a brevet colonel in the regular army in 1862, lieutenant-colonel of engineers in 1863, brevet major-general of volunteers in 1864, and brevet major-general in the regular army and colonel of engineers in 1865.

After the war General Barnard served as senior member of the Board of Engineers and as a member of the Lighthouse Board. He was placed on the retired list in January, 1881. General Barnard was a member and original corporator of the National Academy of Sciences, and was an active member of several other scientific societies. He received the degree of A.M. from the University of Alabama in 1838, and the degree of LL.D. from Yale College in 1864. General Barnard was a contributor to many standard publications, and one of the associate editors of "Johnson's Cyclopædia." Among his principal publications are the following: "The Phenomena of the Gyroscope Analytically Examined" (1858), "Notes on Sea Coast Defense" (1861), "Reports of the Engineer and Artillery Operations of the Army of the Potomac" (1863), in conjunction with General W. F. Barry, Chief of Artillery; "Report on the Defenses of Washington" (1871), "Report on the Fabrication of Iron for Defensive Purposes" (1871), made in conjunction with General H. G. Wright and Colonel P. S. Michie; "The North Sea Canal of Holland and Improvement of Navigation from Rotterdam to the Sea," "Problems of Rotary Motion Presented by the Gyroscope, the Precession of the Equinoxes and the Pendulum" (1872).

Atkinson's Process for Zinc Sheathing of Iron Vessels.

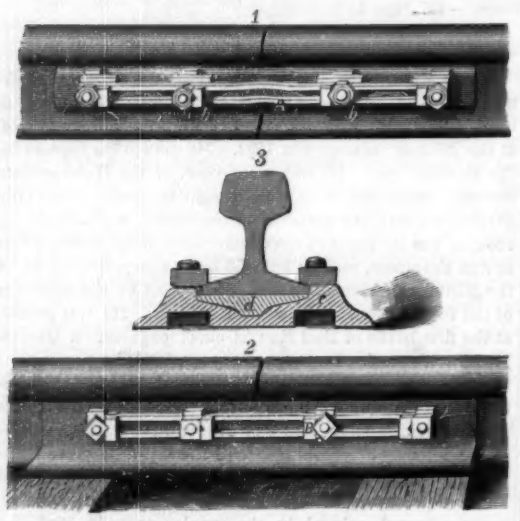
The process consists in fitting thin zinc sheets, of about the size of ordinary shell plates, over the bare shell, the attachment being by solder applied first to spots prepared by an electro-dynamo machine on the shell of the vessel, and then over the same spots when the sheathing has been fitted. Holes are perforated in the sheathing a little less than the diameter of, but made to correspond with, the prepared spots on the shell, which are spaced every way about eight or nine inches apart—and the application of solder after the sheathing has been fitted results in the fusion of the outer and inner layers of solder, and, consequently, the zinc sheathing between. The landing edges and laps of the several strakes of zinc plates are soldered throughout, the whole presenting a surface smoother than the most carefully sheathed wooden ship, and not much behind iron vessels with their finishing coat of anti-fouling paint. The strong galvanic action incident to the conjunction of iron and zinc is matter of common knowledge, and although the utilization of this knowledge for the purpose of ship coating is not wholly new, the manner in which it is done by Mr. Atkinson's process removes almost entirely the objections to its adoption from an economic as well as a practical shipbuilder's point of view. The waste of the zinc, while not inconveniently rapid, is constant and effective as throwing off all species of fouling. One of the vessels already fitted with zinc has been docked at intervals, and the state of the sheathed portion of the bottom has been found invariably to be clean and in every respect satisfactory; while it has been observed that a streak of the bare shell above the sheathing, which had been submerged, is always thickly incrustated with barnacles and other species of fouling. The result of the application of the process in the present instance will be regarded with interest.

THE REMOVAL OF SNOW IN ST. PETERSBURG.—The snow is thrown into pits, which are located at convenient points of the city. It is melted in these by steam, and runs off into the river by suitable channels.

NOVEL NUT LOCK.

The engraving represents a new form of nut lock recently patented by Mr. Albert Berryhill, of Pittsburg, Pa. This device consists of a slotted channel bar having holes for receiving the threaded ends of the bolts, and provided with grooved and notched blocks which slide in the slots and prevent the nuts from turning by being held in contact with the nuts by means wedges as in Fig. 1, or by bending the slotted bar as in Fig. 2. In applying this nut lock, the fish plates and bolts are placed in position and the nuts are turned down upon the slotted plate, A, until the parts are clamped together with the required pressure.

The grooved blocks, B, are then moved along in the slots



BERRYHILL'S IMPROVED NUT LOCK.

of the bar, A, until they touch the sides or corners of the nuts, then the blocks, B, are secured in position by bending the bar, A, inward at *a* (Fig. 2), so as to bring a notch formed in its inner surface into contact with the corner of the sliding block. This particular form is especially adapted to square nuts. Where hexagonal nuts are employed the blocks, B, are held in place by wedges, *b* (Fig. 1), which press the blocks against the nuts and hold them securely in place, and *b* is held in its place by bending the upper part of the slotted bar backward over the wedge.

In Fig. 3 is shown a re-enforcing rail, *d*, which forms a part of the rail joint, and is held in place by a chain, *e*, and the bolts which clamp all together.

The blocks are inserted in the bar when manufactured, making the whole very simple in practical operation.

For further information in regard to this invention address the inventor, Mr. Albert Berryhill, Pittsburg, Pa.

Poisonous Bullets.

A German journal refers to a discovery made by a M. Gros, of Paris, which tends to throw some light on the complaints which were made (but not seriously inquired into) during the Franco-German war, as to the use of poisoned bullets by the combatants on both sides. M. Gros explains that the construction of the modern breech-loading arms causes the bullet to convey with it a portion of the hydrocyanic acid which the explosion of the powder has caused to be accumulated in the barrel. Even if poisoning to a mortal extent does not take place, it is remarked that the healing of wounds is materially retarded by this circumstance.

NEW OIL CUP.

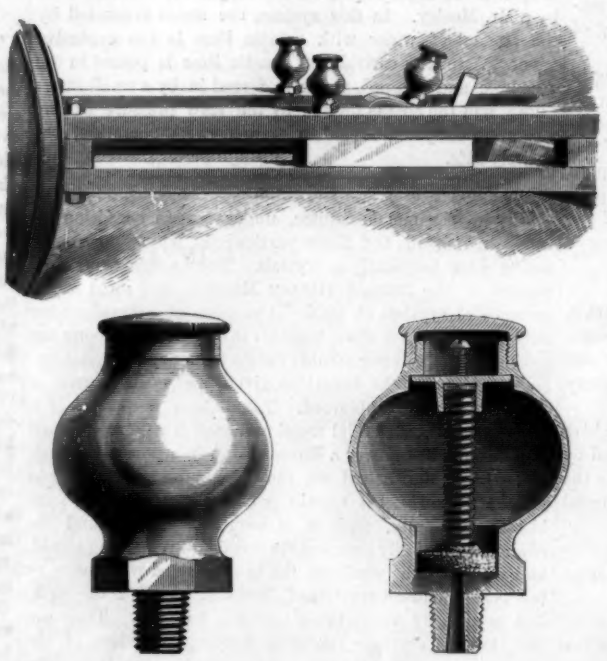
The illustration shows the Bryant self-feeding oil cup in perspective, in section, and as applied to the cross-head and ways of an engine. A steel spiral spring presses at its upper end against a cup piece, having a socket and set screw to regulate the pressure, while the lower end of it is fastened on a metallic disk attached to a thick circular piece of felt, resting on the bottom of the cup and directly over the small hole in the stem, through which the necessary quantity of oil escapes when the machinery to which the cup is attached is in motion. The pressure of the spring upon the disk prevents all escape of oil when the machinery is idle, but the slightest motion of the journal produces a vibration in the spring, by means of which the pressure on the felt is released and oil is permitted to escape through the felt in proportion to the speed of the machinery. If oiling too freely, more pressure is put upon the spring by means of the set screw above it, and if not enough oil escapes, the pressure is reduced in the same way. Once adjusted, no matter at what variable speed the machinery may run, the lubricator will feed in exact proportion to it.

We are informed that not a drop of oil is wasted, and the outside of bearings, as well as the floors and walls, are kept free from oil or grease.

The cup has been fully tested in machinery running from thirty revolutions to thirty-three hundred revolutions a minute, and, it is stated, with entire satisfaction in all cases. A cup holding three ounces of oil has been in use for six weeks on an eighty-horse power rolling mill engine with one filling, and the same size cup on a locomotive for fifteen hundred miles, in each case giving perfect lubrication.

We understand these cups have been well tried and have proved reliable and effective in lubricating locomotives, stationary engines, and other kinds of machinery, using very little oil, but supplying enough to thoroughly lubricate the surfaces.

Further information may be obtained by addressing the Bryant Manufacturing Company, 230 South St., Philadelphia, Pa.



THE BRYANT OIL CUP.

Manufacture of Milk Sugar.

The enormous quantity of cheese manufactured in this country, for export as well as home consumption, leads us to ask why we should be under the necessity of importing milk sugar. Those who may be engaged in making the latter, or intending to embark therein, will be interested to learn of the latest improvements in that line.

In the evaporation of whey, from which the cheese has been removed, a considerable portion of the sugar of milk is lost through conversion into uncrystallizable lactose by the action of the acid in the whey. Engling, therefore, recommends the neutralization of the acid with fine chalk, and then after evaporating it to one-half, he allows it to settle. The clear liquid is afterward decanted or drawn off from the precipitate, which consists of albumen and phosphate of lime, and evaporated still further.

The sugar separates from the purified solution in adherent scales and crusts; upon a further evaporation of the mother liquor a second crop of crystals is obtained. The thick liquid that remains can be dialyzed, and more sugar obtained. From 100 quarts of summer whey eight lb. of refined milk sugar can be obtained. If the whey is frozen first, and the crusts of ice that form are removed from time to time, a strong solution of milk sugar can be obtained in a comparatively short time, which is purer than that obtained by evaporation, because the fat, albumen, and salts are for the greater part intermixed with the ice, giving it the appearance of thin scales with dendritic markings.

In an experiment in making milk sugar in this way, 10 liters of whey, by careful handling, yielded 280 grammes of snow-white milk sugar, which is better than Schalzmann's results, which were 2½ kilos of sugar from 100 liters of whey, although it was the winter whey, which is poorer in sugar.

An Ancient Roman Coin found in Illinois.

A farmer in Cass county, Ill., picked up on his farm a curious bronze coin, which Dr. J. F. Snyder sent to Prof. F. F. Hilder, of St. Louis, who writes about it as follows to the *Kansas City Review:*

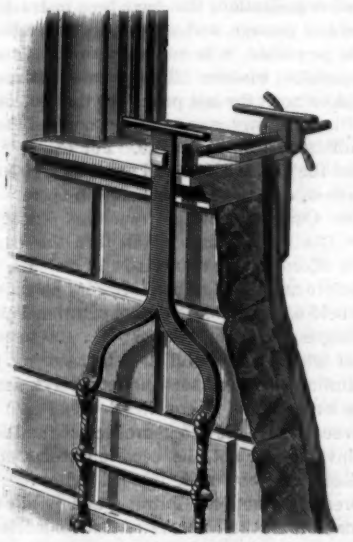
Upon examination I identified it as a coin of Antiochus IV., surnamed Epiphanes, one of the kings of Syria, of the family of the Seleucidæ, who reigned from 175 B.C. to 164 B.C., and who is mentioned in the Bible (first book of Maccabees, chapter 1, verse 10) as a cruel persecutor of the Jews.

The coin bears on one side a finely executed head of the King, and on the obverse a sitting figure of Jupiter, bearing in his extended right hand a small figure of Victory, and in his left a wand or scepter, with an inscription in ancient Greek characters—BASILEOS ANTIOCHOU, EPIPHANOUS, and another word, partly defaced, which I believed to be NIKEPHOROU; the translation of which is: King Antiochus, Epiphanes (Illustrious), the Victorious. When found it was very much blackened and corroded from long exposure, but when cleaned it appeared in a fine state of preservation and but little worn.

NOVEL FIRE ESCAPE.

We give an engraving of a new fire escape which, in case of fire, can be very readily attached to the window sill from the inside of the building, furnishing a ladder for the descent of the inmates, and it may be applied to all forms of window sills.

The invention consists of a forked metal plate, to which the rope ladder is attached, and a clamp plate which comes against the inside of the window sill, the two plates being connected together by a screw-threaded bar carrying a clamping wheel, which may be readily turned for clamping the plates to the window sill. A block is used in connection with the clamping plates and screw rod when the escape is



NEW FIRE ESCAPE.

to be attached to a sloping window sill, so as to elevate the escape and give it a level bearing.

The upper end of the fork is provided with handles, to facilitate climbing out of the window and stepping upon the ladder.

It will be seen that this escape, when attached to the window sill, is perfectly safe and secure, and will in no manner mar the window sill, so that no repairs will be needed in case the fire is put out. Besides these advantages, the device is light, strong, and cheap in construction, and when not in use can be stowed away in very small space.

Further information in regard to this useful invention may be obtained by addressing the inventor and patentee, Helen M. Decker, 113 East 14th St., New York city.

The Lead Keel of the Wenonah.

A twenty-one ton lead keel for the new cutter Wenonah was cast by Mr. Henry Piepgrass, in Brooklyn, May 16. The process employed is thought to have been an improvement on that used in casting the thirty-three ton keel of the Bedouin, noticed some weeks since.

In the former casting there were two pots resting on the top of brick furnaces; in this one there was but one pot, and that was entirely inclosed in the brickwork, so as to economize heat. The pot was oblong in shape, about 8 feet in length, 2 feet in width, and 2½ feet in depth. In the side of this and close to the bottom were two poles three-eighths of an inch in diameter. Leading from these were two iron troughs reaching to the mould, which was formed on the underneath side of the oak keel, which was turned bottom upward alongside of the three furnaces. The keel was 55 feet in length; the mould extended for 30 feet along its center. In the previous casting the molten lead, as it ran into the mould, was cooled to prevent its scorching the wood, by the addition of cold lead; in this one the lead was put in first, the mould being filled with six tons laid loosely, so as to permit the liquid metal to freely flow through it. The wooden keel was also laid with a slight incline, so that its lower end should fill first. The fires in the three furnaces were lighted at noon with about fifteen tons of lead in the pot. As the mass melted additional pigs of lead were thrown in, and at 4 o'clock live coals were thrown on top of the melting lead and a bright fire was kindled on its surface to counteract the effect of the cold wind. At 5:30 there were twenty tons of lead in the pot in a liquid state. Then Mr. Piepgrass, stationing his men at the lower end of the mould, partially withdrew the bar from the hole nearest to this end and permitted the stream of lead to flow as more lead was put in at the top. As the liquid metal reached the top of the mould at its lower end the attendant workman spiked on the covers of plank, repeating the process until the iron trough was reached; then Mr. Piepgrass stopped the flow from this hole and withdrawing the other sufered the lead to flow and fill the other end. When the mould had been entirely filled there was left of the whole quantity of twenty-five tons three and a half tons in the pot and a half ton outside. The lead remaining will be cast in moulds to fit the frames of the yacht, which will have, in addition to her lead keel, twenty tons of ballast inside.

THE FOX KUSU AT THE BERLIN AQUARIUM.

The whole group of animals of the order of Marsupialia derive their names, as is well known, from a pouch situated in the lower part of the abdomen, a broad fold of skin, which is of the greatest importance for the existence and subsistence of the young of these animals.

The pouched animals are born naked, blind, deaf, and with stumpy legs, and are so helpless that it is impossible, even with the greatest care, to bring up the little creatures artificially.

It was a puzzle for a long time how the young were placed in the pouch, but it has been found that the mother takes the little ones up with her mouth, as a cat does her kittens, and places them in the protecting covering. In this pouch are the nipples, which the little imperfect animal would not be able to find if the mother did not immediately press them to it.

The little animal remains in this pouch for several months developing, and finally reaches out its head to look around the world.

Many weeks pass before it ventures to forsake its warm, well furnished little house. Finally it takes the great step, and moves about for the first time in the open air, but at the least noise it returns in haste to its mother's pouch, from which it again looks forth when the imaginary danger is past.

The fox kusu (*Phalangista vulpina*) is a climbing pouched animal, and resembles the squirrel. The length of the body is 60 centimeters, of the tail 40 centimeters. The color of the upper side is brownish gray, with markings of pale red; the under side is yellow, the back and tail black. The tail is used for grasping and holding firmly to objects, and appears to be an indispensable organ.

It climbs and leaps like the squirrel, but the squirrel far surpasses it in intelligence. Like most of the representatives of this order, the fox kusu shows a certain want of mental capacity; this is evident in its motions and in its capture by day. If it is pursued it soon gives up the flight and hangs with its tail to a branch, from which it may be easily taken. It has been ascertained that the continual gaze of the hunter wearies the animal, and in a measure blinds and bewilders it, so that it finally falls down helpless.

The fox kusu inhabits Australia and Tasmania, lives in the forests, and leads a nocturnal life. Its nourishment consists mainly of vegetables, but it likes eggs and young birds.

It is much hunted by the natives for its flesh, which is repulsive to others. The skin is of some value, and is sometimes seen in the market.

The kusu of the Berlin Aquarium was soon tamed, is always peaceable and gentle; but it is difficult to decide whether its amiability does not proceed from stupidity.

THE FOX KUSU IN THE BERLIN AQUARIUM.

Habits of Field Crickets.

One morning after a rainy night, as I was passing along the highway, I noticed one of our common field crickets working at a kernel of corn that had dropped from some farmer's wagon while on the way to market. The rain had softened the grain; and after watching the insect some time, I found it was eating the germ of the softened kernel; I watched patiently until the cricket seemed to have satisfied its hunger, and found the germ had all been eaten away. Early in the fall I found them in cornfields eating the crowns of kernels or ears that had blown to the ground, something I had always before attributed to mice.

The same insect has annoyed farmers considerably in another manner. Much of the harvesting is done with self-binding harvesting machines, using cord for binding. Judge of the surprise and chagrin of the farmer when on drawing in his stacks of grain, to find instead of compact bound sheaves only a mass of unbound grain, the bands of cord having been cut in many places by the crickets. Also I noticed numbers of our common black blister beetle (*Epicauta pennsylvanica*) denuding the ears of corn of the silk before the kernel had been fecundated, thereby either partially or wholly destroying the ear. I have also found *Diabrotica fossata*, Lec., which usually feeds upon the pollen of the flowers of the compositæ, varying its bill of fare by eating the pollen of corn. Its near relative, *D. longicornis*, Say, which I fear is to be the future pest of the cornfield, I found feeding upon both silk and kernel; one individual had excavated nearly the whole interior of a kernel, and was still at work, being so far advanced into the interior as to leave only the tip of its abdomen visible. I had supposed the insect relied upon the flowers of thistle and some of the compositæ for its food, but now think were all of these taken away it would find abundant sustenance in the cornfield itself.—*F. M. Webster, in Amer. Naturalist.*

Sulphate of Ammonia Manufacture on a Small Scale.

By a process invented by M. Hennebutte, liquor containing ammonia, however weak and small in quantity, is said to be rendered profitable as a source of ammonia sulphate. In this process common alum cake is used, which is an impure sulphate of alumina, obtained by treating clay with oil of vitriol. This substance is more conveniently handled than the acid itself. The apparatus required consists only of a wooden cask, which is to be filled with the weak ammoniacal liquor from a small gas works, or with liquid manure. A definite quantity of the reagent is added, and the mixture is allowed to stand for half a day, when the ammonia will be found completely fixed. The sesquicarbonate and hydrosulphite of ammonia contained in liquid manures, when they come into contact with sulphate of alumina, are brought to the state of soluble sulphate of ammonia, while the hydrate of alumina precipitates, and carries down with it all the impurities of the liquid. During the operation carbonic acid and sulphureted hydrogen are, of course, disengaged in considerable quantity, mixed with other gases, which render it advisable that the vessel should be well sealed, and provided with an oxide of iron purifying shelf, whenever the process is carried on near inhabited buildings. After standing for some hours the supernatant fluid containing the ammonia may be decanted without disturbing the precipitate, as the density of the latter continually increases. When it is intended to prepare hydrochlorate of ammonia there is used as a reagent a double chloride of calcium and iron. This salt is very simply obtained by treating powdered alum in a flask containing hydrochloric acid. At the end of 24 hours the iron will be dissolved, and the liquid will be a very acid chloride of iron. This liquid is then poured into a flask containing pieces of lime; and 24 hours later the double chloride formed will be ready to mix with the liquid manure, or gas liquor. The sesquicarbonate of ammonia is decomposed, soluble hydrochlorate of ammonia is formed, and carbonate of lime precipitates. The hydrosulphate of ammonia is converted into sulphide of iron, which likewise precipitates, leaving the hydrochlorate of ammonia in solution. After a few hours' rest this may also be easily decanted. Either of these solutions of ammonia salts may be concentrated by evaporation in trays heated by the spent gases from a furnace.

Iron in Iowa.

The promising discoveries of coal in Iowa have been followed by not less promising discoveries of iron ore. A large deposit, covering more than four hundred acres, and having a depth of two hundred feet or more, is reported in the Lansing Ridge, Allamakee county, about eighty miles north of Dubuque. The *Trade Journal*, of the last-named place, says that the ore is a hematite, like the ore of Salisbury and Kent, in Connecticut. The quality of the ore is pronounced excellent by practical iron workers. The same region is already noted for its lead mines.

RECENT INVENTIONS.

Oil Well Bailer.

Oil wells are cased low enough to shut off all water from the well, and then the water inclosed in the casing is bailed out until but a few feet remain. This water, with the reciprocating motion of the drill, causes the rock to be worked into a thin mud, which is bailed out with a bailer, then more water is again poured into the well, and the drill and bailer are operated in turn. A bailer is an iron tube from fifteen to twenty feet long, with a bail on its upper end to tie the line to, by which it is raised and lowered, it has a valve and valve seat at its lower end, and is made of light iron, to make the weight as little as possible. The valve seat, as ordinarily constructed, is a simple ring, from one to two inches deep, inserted in and riveted to the end of the tube, and when the valve gets stuck in the bottom of the well the holes tear out, and the valve is left in the well. The bailer being open at the top, if then the water in the well is of greater depth than the length of the bailer fills in from the top instead of the bottom, and ordinarily the valve is so tight that the water forces it up before it reaches the thicker fluid in the bottom, and it is not at once removed. An improved bailer, that overcomes these objections, has been patented by Mr. William H. Birge, of Franklin, Venango county, Pa., and is shown in Fig. 1 of the annexed cut. The bailer has its top nearly closed, which prevents the ingress of water. The valve seat is a short metallic tube of the same exterior diameter throughout, but its internal diameter is reduced at the bottom by an annular shoulder. The thin portion of the valve seat is of much greater portion than the shoulder portion, and is driven up into the bailer body so that their edges are flush with each other, and is secured by two or more sets of rivets, thus making a seat that cannot be torn out. The valve is of the common style, and is within the body of the bailer and fitted to close upon the body of the valve seat, and is secured on the upper end of a screw bolt that projects downward, and has at its outer end a head that is of sufficient weight to hold the valve to its seat until the head strikes the bottom of the well, when the thin mud passes in and is raised to the surface.

Combined Slate Cleaner and Pencil Holder.

A combined water receptacle and sponge holder is shown in Fig. 2. It is so constructed that it may be attached to a pencil, the object being to provide a cleanly, convenient, and inexpensive article for use in cleaning slates. The metal water receptacle is made of suitable size and form, the thimble shape being preferred. The pencil clamp is attached to or formed with the thimble, and is a short tube split lengthwise to form spring tongues, and fitted with a sliding ring, by which the tongues are clamped on the end of the pencil. A cork is fitted into the open end of the water holder tightly, and to the outer end of the cork is secured a sponge by a staple, and in the side of the water holder there is a small orifice, through which the water will escape in drops when the holder is shaken, but not otherwise. The device is very convenient as a slate cleaner, and serves as a pencil holder. The point of the pencil may be put in the clamp for protection when not in use, and the device serves to prevent the pencil from rolling off the desk. The above device has been patented by Mr. William H. Metcalf, of Brooklyn, Kings county, N. Y.

Method of Making Shoe Nails.

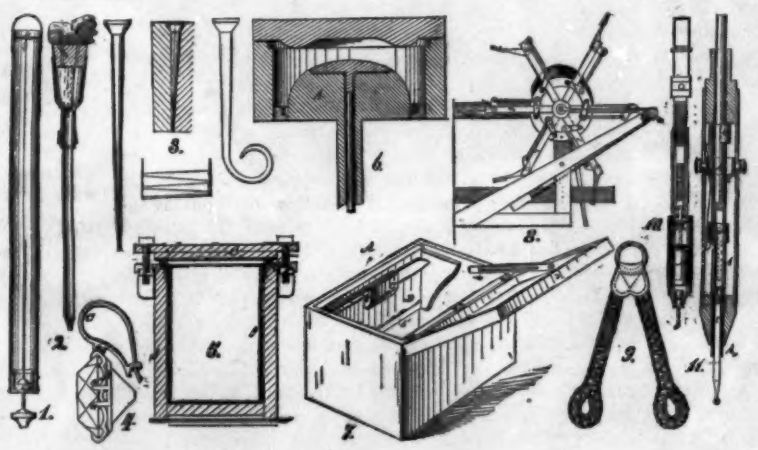
To furnish nails that will curve back in clinching, for fastening the soles of boots and shoes and that can be made lighter than nails made in the ordinary way, is the object of the recently patented invention of Mr. John Hyslop, Jr., of Abington, Plymouth county, Mass. The invention is shown in Fig. 3. The nails are cut from a strip of sheet metal, of the thickness of the points of the nails, and the width of the length of the nail. The blanks are cut of a width at the point equal to the thickness of the plate, and the head is of a width that will furnish sufficient metal to give the desired size and taper to the nail, and is pressed or upset by dies, so formed as to grasp the blank from its head to or near its point, and to give the nail a uniform taper from head to point, and they may be made with or without heads as desired. The dies are made with one-half of the tapering cavity in each die, and the blank is pressed width-ways between them, so that the width decreases while the thickness increases until the cavity is filled. The dies are adapted to be used in an ordinary nail machine. Nails, as ordinarily made, when they are driven against the iron bottom of a last, bend to one side at a right angle, and the clinch has little strength; but these nails being round, or nearly so, curve back upon themselves, forming a clinch of great strength, and the nails being made of uniform taper, will not work forward, but form a secure and reliable fastening.

New Jewelry Setting.

We find among the recent patents an ingenious setting for diamond earrings, invented by Mr. Harrison B. Smith, of New York city. The object of this invention is to obtain light appearance in the settings and to display the stones to the best advantage. The setting of the stone is a narrow ring or band, of proper size, and beveled for fitting snugly to and around the edge of the stone, and is provided with cramps on its edge, which being turned down over the edge of the stone, it is securely held. Between two of the cramps is an eye for the ear loop, the eye being level with the edge of the stone. It will be seen that with this setting the back of the stone shows as well as the front, and the stone itself is displayed to the best advantage, and the setting is subordinate to it.

Improved Butter Case.

The wooden cases in general use for packing and transporting butter are objectionable on account of the taint they impart to the contents, and because of the loss by soakage or absorption of the butter by the wood, leaving a space between the case and the butter, and exposing it to the influence of air and bad odors. An inexpensive, light, and durable package for containing and preserving butter fresh and sweet for any length of time, and in which the finest grades of butter may be put in summer and kept for winter use, has been lately patented by Mr. John K. Hamlin, of Philadelphia, Pa., and is illustrated in Fig. 5 in the annexed cut. The package consists of a wooden box of suitable size containing an inner box of sheet tin or galvanized sheet iron, that fits snugly within the box. A cast iron ring, to which the tin box is soldered, rests upon the upper edge of the box, and is formed with tips projecting upon the sides of the box, through which screws are inserted to retain it in place, and it has also formed upon it slotted lugs for securing the cover. The cover is formed of wood, and is lined with tin, and on its upper surface has strengthening cleats that project over the lugs on the box, and are slotted and carry screw bolts which, when in place, pass into nuts placed beneath the lugs of the box. The under side of the cover has a packing ring made of suitable material and covered with paraffine, that rests on the metal rim of the box. The inside of the metallic box is lined with slides of tin that are covered with paraffine, and are also faced with muslin that has been previously saturated with a solution of borax. The muslin on the slides absorbs the brine liberated during packing, and the anti-acid and antiseptic properties of the borax retard and prevent the formation of acid from which the rancidity of butter comes. A sheet of paper coated with paraffine is placed over the opening of the case, and on this the packing ring and lid are placed and screwed down tightly.



1. Birge's Oil Well Bailer.—2. Metcalf's Slate Cleaner and Pencil Holder.—3. Hyslop's Horseshoe Nail.
4. Smith's Jewelry Setting.—5. Hamlin's Butter Case.—6. Leak's Mould for Paste Boxes.
7. Fournier's Bread Box.—8. Kanne's Harvester Reel.—9. Netzger's Suspender Strap.—10. Ebi's Dental Plugger.—11. Richmond's Dental Drill.

Bread Box.

Among the recently patented inventions is a novel and convenient bread receptacle, composed of a box for holding bread and a board upon which to cut it and provided with a knife. It is the invention of Mr. Joseph Fournier, of New York city, and is shown in Fig. 7 of the annexed cut. A is the box, and B is the board upon which the loaf of bread is supported while being cut. The box is made of any suitable size and material. Inside of the box, upon the end pieces, are secured end cleats of a triangular shape, and upon the inside of the front board of the box is secured a cleat. The end cleats are at such a distance from the front side as to admit the thickness of the board, B, and the cleat on the front board is below the upper edge of the board a distance equal to the width of the board, making a secure place in which the board can be placed. To facilitate the withdrawal of the board, the ends of it are rounded so that they will not bend, as would be the case if they were left square. Upon the inner side of the board is secured a block that is adapted to receive and hold the bread knife. To the box is hinged a cover provided with a slotted metal strip, which moves on a pin secured to the inside of the end of the box, and that holds the cover from tipping too far back when it is opened, and when the cover is closed the strip moves down toward the bottom of the box so as not to interfere with the closing of the cover.

Making Porcelain and China Paste Boxes.

An invention, by which the removing of the moulding dies and mandrel from a clay mould of a porcelain or china paste box without breaking or damaging any parts of the mould is greatly facilitated, is shown in the annexed cut, and is the invention of Mr. Elias Leak, of Trenton, Mercer county, N. J. The mandrel, A, has a rounded moulding surface of the same size and shape of the cavity of the paste box that is to be made, and this mandrel is provided with a tubular handle projecting down from its bottom surface. The middle part of the rounded moulding surface of the mandrel is formed by a removable plate that fits in a recess in the rounded part of the mandrel, the rounded surface of the plate and of the mandrel being flush. A handle projects downward from the lower surface of the plate through the tubular handle of the mandrel. A ring provided with an annular groove in its upper and inner edge fits closely around the lower edge of the mandrel and is detachable from it, and the width of the ring is such that it fills the annular space between the lower edge of the mandrel and the lower edge of the outer die. When the die is placed together properly and the box is moulded, the box is removed by first removing the top die, then press the mandrel upward by the handle, and the moulded box, the mandrel, and the ring leave the outer die. Then the removable plate is pressed upward by its handle, when the moulded box will be removed from the mandrel. When the ring is removed from the neck of the box it will be found that the box is perfect.

Jointed Harvester Reel.

We give herewith an engraving which illustrates an improved jointed reel for harvesters, lately patented by Mr. Frederick F. Kanne, of Waterville, La Sueur county, Minn. *a* is the platform of a harvester, provided at its front edge with fingers and cutters of any of the well known constructions. *b* is the horizontal shaft of a reel that is journaled in a vertical reel post, secured at its lower end to the platform near its front edge and at the driver's side. The reel is unsupported by a post on the grain side of the harvester, and is provided with a central gudgeon at this end, to which a metallic hook is secured, to the upper end of which a cord is attached that extends over a pulley in the upper end of an inclined brace attached to the platform, and provided with a weight by which the end of the reel shaft is supported. At the driver's end the reel shaft is provided with a grooved cam, and the cam is provided with an eccentric hole for the passage of the reel shaft, and is also provided with a lever secured to its closed face on the driver's side, by which the driver in his seat, and while the machine is in motion, can, by raising or lowering the lever, give more or less pitch to the cam and to the joints of the reel. The reel shaft is provided with reel arms, and each arm at its outer end has attached to it by bell crank levers a slat or beater. These beaters are so connected to the cam on the reel shaft by rods and rollers that in the revolution of the reel in the usual manner the beaters will seize the uncut grain and raise it up on the platform, raising lodged grain. On windy days, when the grain leans from the platform, the reel will reach over the heads of the grain and move it back to the cutter bars. This reel will not force the grain over the platform, because the beaters are tipped by the motion of the cam and lift themselves out of the cut grain on the platform slowly and gradually.

Suspender Strap.

An ingenious and very serviceable suspender strap, patented by Augusta Netzger, of New York city, is shown in Fig. 9 of the accompanying engraving. The suspenders are provided at their lower ends with a button loop, and their upper ends are attached by a leather or other suitable fastening to a ring in the usual manner. The straps are made of knotted cords in the following manner. Two or more strands of cord are placed parallel with each other to form a core, and at their middle are surrounded by two other cords, that are knotted together every time they have passed around the strand, whereby that portion of the strap forming the loop is formed. Then the ends of the knotted strands that are in the inner part of the loop are brought together and placed parallel with each other and with the parallel strands of the loop. The strap will then be formed of six strands, but only two in the loop part, which must be more pliable than the body. When the strands have been folded as above described the remaining outer strands of the knotted cords are passed around the six strands directly above their place of uniting, and, as before, every time they pass around they are knotted, and in this way the strap is formed from the loop to the upper end of the strap. Two such straps are united and attached to the ring, as shown. The cords can be of different colors and different styles of knotting, and be very ornamental, and will be very durable.

Dental Plugger.

Mr. Edward Ebi, of Cedar Rapids, Linn county, Iowa, has patented an improved dental mallet for compressing the metals used in filling teeth. It is shown in Fig. 10 of the annexed engraving. A solid plunger is contained in a tubular casing that is provided with two longitudinal slots through which pins pass into the plunger, for the purpose of

guiding it and holding it in the casing, and a spiral spring is interposed between the top of the plunger and the top of the casing. This casing is adapted to slide in a casing, E, which is provided at its upper end with a split tube for holding it to a dental hand piece. The inner casing is connected with a small crank shaft, H, journaled in the outer casing, E, by a pivoted connecting rod. A bevel cog wheel is rigidly mounted on the shaft, H, and engages with a bevel cog wheel, mounted on the end of a shaft projecting from the upper end of the casing, E, into the rotating part of the hand piece. A short tubular piece, flanged at top and bottom, fits loosely in the aperture at the lower end of the casing, E, and serves to hold a plugger point. When the shaft of the hand piece is rotated the crank shaft, H, is also rotated, and the casing containing the plunger is reciprocated, the plunger striking the plugger holder every time it descends. If the dental engine is operated slowly, the impact will be gentle; if it is operated rapidly the blows follow each other more rapidly and the impact will be much greater.

Improvement in Dental Drills.

Mr. Cassius M. Richmond, of New York city, has recently patented an ingenious tool holder for dental engines, which is constructed in such a manner that the tools can be readily attached and detached and will be securely held when attached. The holder is clearly shown in Fig. 11 of the opposite engraving. A is a rod, one end of which is designed to be connected with the flexible shaft of a dental engine, and the other end is perforated longitudinally, and in this perforation is placed a rod, B. To the inner part of this stem is attached a cross pin whose ends project through slots in the rod, A, and are attached to a sleeve which slides freely upon this rod. The slots in the rod are made of such a length that the rod, B, can be slid outward so far that its end will project beyond the rod, A. The stem, B, is held in place, when pushed inward by a spring catch, the shoulders of which engage with the sliding sleeve on the rod, A. The spring catch is fulcrumed to the rod and its rear end rises from it, so that the catch can be disengaged from the ring, E, by pressing the rear end inward. In the end of the shank of the tool is a rabbet and a cross groove that corresponds with a similar rabbet and cross groove formed in the lower end of the rod, B, the two parts interlocking with each other and leaving their outer surfaces flush and smooth. When the tool and stem have been interlocked and pressed inward it will be impossible for the tool to become detached accidentally, and at the same time the tool will be held firmly, so that it can do good work.

Action of Aluminum upon Copper Chloride.

Even at common temperatures aluminum reacts briskly upon a solution of copper chloride. The products of the reaction are hydrogen, metallic copper, and an aluminum oxychloride, the composition of which varies according to the degree of concentration of the copper solution. The oxychlorides seem not to be definite compounds, but mixtures in variable proportions of aluminum chloride and oxychloride. They are non-crystalline, and are easily decomposed if heated even in the water bath. The solution of aluminum oxychloride, like that of ferric oxychloride, is precipitated on the addition of sulphuric acid and of certain salts. A single drop of sulphuric acid determines a coagulum of aluminic hydrate so abundant that the whole liquid is solidified. The hydrate obtained is sparingly soluble in sulphuric acid, and is probably not ordinary alumina, but an isomeric modification. Among the salts which throw down alumina from its oxychloride are sodium, ammonium, potassium, zinc, copper, magnesium, and iron sulphates. On the contrary, potassium, ammonium, copper, and barium chlorides, potassium bromide and iodide, ammonium and potassium nitrate do not precipitate aluminum oxychloride, even at a boil.—*Dr. D. Tommasi.*

Dephosphorization of Iron.

At a recent meeting of the Society of Arts a paper was read by Sid Gilchrist Thomas and Percy C. Gilchrist, on the manufacture of steel and ingot iron from phosphoric pig iron. The authors, after stating that nearly nine-tenths of the iron ores of Europe were so phosphoric as to produce a pig iron unfit for steel making without a process of dephosphorization, showed that by the new lime process perfect dephosphorization was produced, so that the steel made from phosphoric pig was actually purer than that made from hematite iron. They then instituted a comparison between the basic Bessemer process and the puddling process, pointing out that the former process was peculiarly adapted to the manufacture of soft weldable steel, having all the characteristics of puddled iron, with considerably greater strength, elasticity, and ductility. It was stated that this soft, basic, Bessemer steel could be made for some shillings a ton less than ordinary puddled iron, while an economy of seven shillings a ton was gained in its subsequent treatment by the smaller loss which it undergoes in rolling. The authors stated that nearly half a million tons a year of the new dephosphorized metal were now being made, and that on the Continent works were erecting having a capacity of a further half million tons a year, while in England the new special works erecting had only a capacity of under 200,000 tons a year. The paper concluded by querying the wisdom of allowing continental iron masters to push so far ahead of us in the production of this new ingot iron, which was not only cheaper, but immensely superior to puddled iron.

Manufacture of Green Tea in India.

A correspondent of the *Indian Tea Gazette* says:

"Manufacture can be commenced as soon as the leaf is plucked, but as it is more convenient to manufacture a day's plucking at once, the leaf plucked during the day is allowed to be all night in the leaf shed, spread out from two to four inches deep, and is constantly turned over to prevent heating.

"The manufacturing process is as follows: A large iron *karai* or pan, 36' diameter by 12' deep, is heated almost red hot, and when ready is filled with green leaf, which is rapidly turned about to prevent burning, until it has become quite soft, and the mass reduced to about half its former size. This process takes about three minutes. It is then thrown on the rolling table, and while the next panful is being prepared, is rolled by the tea makers. As the leaf is perfectly soft and flaccid, the rolling is done in the same time as the panning takes. If there is any sun, the rolled leaf is then thinly spread out in it until it becomes a blackish green and is very sticky to the touch; or if cloudy is put in *chalnees* over charcoal fires until in the same condition. It is then put into smaller iron pans, 25" in diameter by 12' deep, which are only heated to such a degree that the hand cannot be kept on the iron. These pans are about half filled, and the leaf is kept turning over until it has become quite soft again, when it is again rolled. When the day's batch has all been rolled a second time, the small pans are filled to the brim, the heat being gradually lowered, and the leaf is cooked, being constantly turned about as before for about four hours, when it is almost dry to the touch. If a large quantity of the two classes of gunpowder are required, it is then screwed up in bags as described by your correspondent, but this is not necessary nor indeed advisable at present, as the gunpowders do not bring the same prices as young hyson and hyson, a quantity of which classes become gunpowder in the screwing. The tea may now be left for weeks in the bins before being classed and colored, but we will suppose that the next process takes place next morning. The small pans should be heated to the extent of burning the hand if kept on the iron for a short time, and about half filled with the tea, which is worked rapidly from side to side until it assumes a light greenish tint, which will take about an hour and a half. It should then be classed, fanned, and picked. Before being bagged for market, about the same quantity is put into the pans, heated to the same degree as before, and is again worked rapidly to and fro for about two hours until it has assumed all the bloom it will take—usually a whitish green; but if the leaf is hard and old when plucked, the color will turn out yellow green, and will require coloring matter, usually pounded soapstone. It is in this last panning that the coloring matter is put in, but I believe that the Europeans in this district do not use it unless requested to do so by the native buyers. It is easily detected by taking a handful of unadulterated tea and breathing on it, when it will be found that as the damp dies off the bloom will return, but will entirely disappear in adulterated tea. The tea is then packed hot in 200 lb. bags composed of an inner cloth and an outer gunny bag, and is dispatched in this state to market. In heating the pans, wood is always used, and it is quite as efficient as and much cheaper than charcoal.

The River Amu or Oxus.

East of the Caspian Sea there lies spread out a vast extent of country of which the rest of the world knows but little, nor knows that little well. Through it there flows a mighty river, which appears to have the power of changing its direction now and then at will, leaving its bed and resuming it without asking permission of the Czar. Since Russia has obtained possession of the countries bordering the Caspian Sea on the east, more attention has been directed toward the old bed of the Oxus (or Amu), with the intention of trying to induce the river to return to its old channel. The matter did not seem to make any real progress until 1880, when a dam broke away near Chiwa, and the river again went in quest of its old bed from this place onward toward Old-Urgendsch. Hence arose the question whether this stream could not be turned again into the river instead of emptying where it does. A survey of the Oxus, led by Petrussewitsch, from Chiwa down, yielded encouraging results. According to his report the river is navigable from Chiwa for vessels of small draught, and the quantity of water is considerable, about like that of the Volga at Symbirsk, and would suffice to make it navigable all the way to the Caspian Sea.

The descent to the Sea of Sary-Kamysch, in the southwestern part of the basin of the Aral, is all that is needed, and there is no danger of its filling up with sand, because the current caused by the fall is able to keep out the sand. It is very probable that the stream had two courses through the oasis of Chiwa; at present there are three. Of these the two northernmost flow into the Sary-Kamysch, while the southern one loses itself in the desert. A commission appointed to examine this region reported that this sea was situated 15 meters below the level of the Caspian Sea. This gave rise to doubts as to the possibility of conducting the Amu River through this sea, for it was thought that the river would not be able to fill up this basin of 11,000 or 12,000 square meters, and that a large portion of the water must be lost by evapotion, so that there would be none left to enter the Caspian Sea. Dr. Lenz, of St. Petersburg, in a communication to the *Globus*, opposes this view, and shows that after filling up this basin the river Amu would still be able to bring a considerable water to the Caspian Sea.

The Aral, says Lenz, has a surface of about 67,600 square meters. The Amu-Darja brings to it three times as much water as the Syr-Darja, so that that gives the Amu 50,700 square meters, and the Syr 16,900. It can be said that the Amu brings along as much water as would evaporate from a surface of 50,000 square meters in extent. If this river had to fill up a lake of 11,000 or 12,000 square meters in area, as the Sary-Kamysch is estimated by the commission to be, only one-fourth of the water would evaporate, and three-fourths of all the water could flow into the Caspian Sea. Whether the Amu would really take its course through the so called bed of the Usboi, or Duden, as the Turks call it, can be better judged of after the completion of the surveys already undertaken and quite far advanced by the Russian government. Prof. Lenz is influenced by historical circumstances to assume that the Amu once really did flow into the Caspian Sea.

The results of the expedition of 1876, '7, and '9, which prove that the slope of the country from Laudon to Usboi is twice as great as the actual fall of the river to Aral, and the circumstance that the oasis of Chiwa only takes one-eighth of the water of the Amu to irrigate it while the remainder of the water evaporates uselessly in the side arms, in the delta of the river, and in the Ural sea, all these indicate the correctness of the views of the author above named.

It may be otherwise as regards the traffic on the newly procured river. Chiwa and Bucharest have but slight productive power, and will scarcely change much, since the increase of population and the attendant production cannot be very considerable within the limits of the oasis. A more favorable prognosis may be made of the newly watered region of the Usboi. If what Abul-Ghazi-Behodur says in his description of this region is correct, that in his day, when the Amu still flowed through it, it was very fruitful and densely inhabited, the reclaiming of this strip of desert, 1,200 versts wide, will amply repay its cost. H.

On the Production of Sugars and Starch in Plants.

Ad. Perrey has made some interesting communications to the Paris Academy in regard to this subject, from which it appears that the leaves of beans on the 29th of June contained no trace of any glucoses in the five samples tested. On the 7th of July it made its appearance in the stems, and stayed in them until July 29. From this he concludes that glucose is not formed directly from chlorophyl.

Saccharose, on the other hand, showed itself in the leaves constantly from June 29 till July 29. Under glucoses he includes whatever reduces Fehling's solution immediately, while those which reduce it only after invertion are classed as saccharose (cane sugar).

	GLUCOSES.		SACCHAROSE.	
	Leaves.	Stems.	Leaves.	Stems.
June —	16	56	25	90
" 29	0	0	56	38
July 7	0	36	34	51
" 15	0	30	8	50
" 29	0	11	23	64
August 13	0	9	Trace.	30
" 26	10	14	24	28
September 11	12	23	42	30
" 28	14	15	42	37

The question is now discussed as to whether the saccharose, which is constanly present here, is formed directly or is produced by a doubling of the starch molecule, something like the way that Berthelot represented as its possible constitution.

$$\underset{\text{Cane sugar.}}{C_{12}H_{22}O_{11}} + \underset{\text{Glucose.}}{C_6H_{12}O_6} + H_2O = \underset{\text{Starch.}}{3(C_6H_{10}O_5)} + 3H_2O.$$

According to this a small quantity of glucose must appear in the leaves momentarily at least. Millot concludes from this observed absence of glucose that saccharose is formed directly from its elements by the cell power. Glucose, on the other hand, is in all plants (beans, oats, and Indian corn), and always in the presence of saccharose, and therefore is to be considered as the product of its dehydration.

The presence of a small quantity of starch in the cells might be due to a secondary reaction between the saccharose and the glucose. This, which is a matter of secondary importance in the leaves, becomes a primary reaction in the seed; on entering the seed or grain the glucose disappears, while the saccharose continues there. The two kinds of sugar combine, molecule with molecule, and form starch. A small portion of the glucose is used up in the formation of starch. At germination the starch breaks up into dextrine and glucose.

Saccharose then appears to play the essential part in plants, for it is formed directly, while glucose and starch are made from it.

If this is true it is hardly likely that if the synthesis of cane sugar is ever accomplished the sugar will not be made either from starch or glucose; and should some ingenious chemical investigator succeed in making starch artificially from glucose and saccharose, which seems probable, it would be of no practical or economical use, though of theoretical interest. Some other source for artificial saccharose must be sought instead of starch and dextrine. What that source is has never yet been even indicated, so far as we are aware, but carbonic acid ought to be one of the elements employed in some of its innumerable transformations.

There is annually manufactured on the Mississippi River and its tributaries about 1,500,000,000 feet of white pine lumber, with its proportionate accompaniment of shingles, laths, and pickets.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) F. A. W. asks: 1. Will a small glass cylinder, say four inches in diameter (if speeded up), answer in building a frictional electric machine? A. It will answer in a small way. The small diameter of the cylinder will limit the power of the machine whatever may be the speed. 2. How is the amalgam prepared for putting on cushions? A. Melt eight parts of zinc and two parts of tin together. Place four parts of mercury in a wooden box coated inside with chalk, and pour into it the melted tin and zinc (not too hot). Put the cover on the box, and shake violently until the amalgam cools. Pulverize in a mortar, and mix with a little lard.

(2) W. H. O. writes: 1. Our engine is 14x18, with 8 foot drive pulley, with a 3 foot driver on the main shaft; engine now runs 130 per minute. Which would be the best to get more power, by putting a 6 foot driver on the engine, or one large enough on the main shaft, and to run 150 per minute? A. Larger on main shaft. 2. How much more power would we get by running it to 150? My idea is the 6 foot on the engine would be the best, but our engineer differs with me. A. The increase with same pressure would be as 130 to 150. 3. Would it not take as much steam by running 150, and the 6 foot driver? A. The increase in quantity of steam required would be in same proportion if doing increased work.

(3) J. M. F. asks: Will you please state how to soften rubber and to harden it again? A. If you refer to ordinary or vulcanized rubber, try digestion in bisulphide of carbon to soften and exposure to air to harden again. Rubber is usually moulded before vulcanizing it, when a moderate heat suffices to soften the substance.

(4) R. W. H. writes: I have great difficulty with belts slipping. I covered one pulley with leather, which, as long as it lasted (remained attached), worked well. How can I make the leather adhere to an iron pulley without drilling and riveting? A. Try the following for fastening leather on the pulley: Steep the leather in an infusion of gall nuts; a layer of strong hot glue is spread upon the pulley, and the leather forcibly applied on the flesh side, and allow it to dry under the same pressure. Marine glue may also be used to advantage in a similar manner.

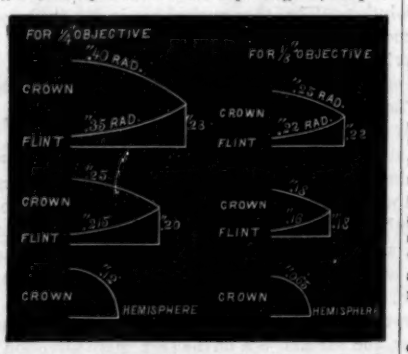
(5) W. H. G. asks: 1. Which is the best method for plating cutlery, etc., with tin, by the electro-plating process, or by the immersion process, by dipping into the hot metal? A. See "Tin Plating," SUPPLEMENT, No. 310. For such goods the hot dip is generally preferred if a heavy coating is desired. 2. Can that bright luster be obtained after the articles are plated with the battery, that the articles have by the immersion method? A. Yes, if the current has been properly applied. 3. By the immersion process the handles are liable to be injured. How will the battery affect them? A. The battery solution used cold will not injure the handles under ordinary conditions.

(6) G. M. asks: 1. Will a cylinder boiler, made of brass, diameter 9 inches, length 18 inches, to be heated by means of kerosene lamps, be sufficient to generate enough steam to run a double acting engine, cylinder, diameter 1½ inches, stroke 3 inches. If not, please state size required? A. Only about half enough boiler. 2. Will brass one-sixteenth of an inch thick be sufficiently strong to stand the pressure? A. It should be one-eighth of an inch thick. 3. What size safety valve shall I use on such a boiler? A. Three-quarters to one inch diameter will answer.

(7) W. H. B. asks: Will you please tell me how I can transfer prints from paper on to metal? A. To transfer a fatty ink engraving on metal proceed as follows: First coat the face of the dampened engraving with clear copal varnish, made rather thin, and when this has partly dried press it smoothly and firmly into contact with the metal plate, and allow it to remain until dry. Then moisten the back of the engraving, and with a moist sponge, a piece of soft rubber, and the fingers, rub the softened paper until it has crumbled away, leaving nothing but the inked lines adhering to the varnished metal.

(8) G. W. T. asks: 1. Which is the best and most profitable method of polishing pretty coarse brown walnut? I have tried many manners, but none of them will stand any length of time. A. For brown walnut, fill well with shellac varnish and rub down with French polish. If a varnish surface is required that shall be smooth, fill as before with shellac varnish and rub down with fine sandpaper, and repeat if a finer surface is desired, then varnish with copal or other hard drying varnish, and rub down with French polish. 2. How is the bright hard polish on sewing machines obtained? A. The bright surface on sewing machines is obtained by using the best Japan varnish, drying in an oven free from dust at a temperature of about 235° Fah. If the work is required to be very smooth, it must be rubbed down with fine sandpaper or ground pumice stone in water, according to the requirements of the work, then put on another coat of japan and bake as before. 3. What sort of varnish is applied to cover the transfer pictures, and is this varnish hardened cold or warm, and how many degrees are allowed? A. The transfer pictures should be covered with thin mastic varnish. Use a fine flat camel's hair brush and brush lightly, so as to conceal the overlapping of the mastic upon the japan varnish. Dry by baking at about 150° Fah.

(9) R. H. F. writes: I have made a large compound microscope stand, and with a one inch objective I have obtained good results. As I either have or can readily make the tools for grinding small lenses, I would like to experiment on making some one-quarter inch and one-eighth inch objectives. Can you tell me what are the focal lengths of the lenses used, and how they are combined to make such objectives? A. For these objectives you can make all of the front surfaces plane, working to the diagram as nearly as possible. The figures given will not be absolutely correct for all kinds of glass. Select good heavy flint and good crown glass; make your set of lenses as per diagram, and place



them in a temporary and adjustable setting, so that for the quarter inch you will have the hemispherical front, and the second pair about one-sixteenth inch apart, the second and third pair about one-eighth inch apart. If the right kind of glass is chosen, the lenses well polished and centered, you will only have to make a movement of one or two of the lenses backward or forward for the final adjustment. But if the chromatic aberration is not correct, or the spherical aberration is over or under correct, trouble begins. The correction for color may be made by altering the inner curves of the back pair, and the correction for spherical aberration may be made by altering the inner curves of the middle pair. Of course the beginner can hardly expect to accomplish all this at once. It has taken a long time for professional opticians and mathematicians to bring objectives to their present perfection, and there is still room for and expectation of improvement.

(10) B. & W. write: On several of the locomotives of our western railroads, the whistle is so arranged that when the valve is opened the tone rises clear and bell-like to a high note, and then is made to descend the scale, and die away gradually on a lower tone than that made at first, and producing a very weird and striking effect. Can you tell us how it is produced? A. These whistles are made with a sliding piston inside the bell operated by a lever let in through the steam chamber with a piston rod connecting the two parts together. The bell is much longer than the ordinary whistles to make the range of tone to suit, and may be adjusted to range a musical third, fifth, or octave. 2. Also, can you tell us the requisites for a good clear whistle of medium high pitch, one that will not be wheezy? A. If you have dry steam, the whistles made for the trade in the Eastern States are generally clear, or may be made so by adjusting the bell nearer or further from the aperture, which can be done by loosening the nut and turning the bell up or down on the threaded spindle. The requisite instructions for making a whistle could not be given without drawings. Find a good toned whistle in use and study its construction.

(11) E. G. W. asks: What is the theory of elliptical wabble saws, and for what purpose are they used? A. These are circular saws set at an angle upon the spindle for the purpose of cutting grooves. For instance an ordinary saw set upon a spindle, so as to wabble an eighth of an inch each way from the natural plane of motion, will cut a groove a quarter of an inch wide. If the saw is tried up in this position, and all the teeth brought up sharp, it will cut a square angled groove. Upon measuring the two axial diameters of the saw, it will be found slightly elliptical. Hence its name.

(12) G. F. S. and S. B. ask: Can you give us any data with regard to the heating or steam producing qualities of petroleum oils and other liquid fuels? A. The following table by Professor Rankine will probably afford the information desired:

For one pound of	Total quantity of heat generated. Heat units.	Quantity of heat available for producing steam. Heat units.	Quantity of water heated from 60° to 212° Fah. and converted into steam at 212° Fah. Lb.	Temperature of the flame. Fah.
Crude petroleum	20,000	16,847*	15	4,646°
Crude paraffine oil	20,000	16,847*	15	4,646°
Heavy oil from shale or coal	20,000	16,847*	15	4,646°
Dead oil or creosote	16,696	14,567*	13	4,406°
Coal { from	13,800	10,001†	9·98	3,500°
Coal { to	14,893	10,817	9·67‡	3,503°

* It is here assumed that the oil is burnt with only just enough air for combustion, and that the products of combustion is discharged at 600° Fah.

† Burnt as usual with twice the air necessary for combustion.

‡ The evaporative duty here assigned to coal is probably higher than that actually obtained on the average in steam vessels to the extent of about 30 per cent. Seven pounds of water converted into steam per pound of coal consumed being nearer the actual average obtained with coal in steam vessels.

(13) P. E. writes: I got a mercury barometer some eight months ago. The mercury has since remained stationary at the same height. By sufficiently inclining the instrument the mercury in the tube rises to the very top, the air has free access to the mercury in the cistern. The tube has not over a quarter of an inch internal diameter. Perhaps adhesion of the mercury to the glass is the cause of this. What can be done to render the barometer efficient? A. The mercury will sometimes slightly adhere to barometer tubes of small diameter by capillary attraction; this should not interfere materially with its movement, provided that on tipping the tube the mercury strikes the top with a sharp click, assuring you that there is no air in the tube. In some seasons the range of the barometer is very slow, and will not be easily noticed unless an index is attached and adjusted at each observation. We would recommend you to give it a thorough trial by the index.

(14) E. G. S. writes: In making a dynamo-electric machine, such as is described in SUPPLEMENT, No. 161, will it answer to make the electro-magnet of hard cast iron while the bell magnet is made of soft cast iron? Will it not answer to cast the journal of the bell magnet and the bell magnet in one piece, but have the journal run in brass? A. Soft iron should be used as in dynamo for both magnet and armature. 2. What is condensed petroleum or petroleum mass? Can it be made by carefully boiling kerosene? A. You probably refer to petroleum "foot," the tarry residue from the distilling crude petroleum. It can not be obtained in the way you propose.

(15) W. G. S. wants to know how to braze a bend saw so as to make a good joint without burning the saw. A. The best material for brazing these saws is the silver solder used by jewelers. Small coin will answer if you cannot get the other. Rolled sheet brass is better than copper. If the saw is not too large, use a blow pipe and oil or alcohol lamp, with wick about three-quarters of an inch diameter, the same that jewelers use, or a Bunsen gas burner. Bind the scarfed ends together with small wire, and pin the saw upon a piece of charcoal or pumice stone, rubbed down flat on one side, and a depression under the place to be brazed, to let the flame pass under freely; apply borax ground to a cream in water, place the solder at the edge of the scarf, throw the blue point of the flame strongly upon the under side so that the solder may draw through when it melts. This will make a clean joint and heat no more than is necessary to accomplish the work.

(16) F. A. W. asks: What can I use to make linen, damask, etc., semi-transparent—something that will not stain and can be readily washed from the cloth? A. Try castor oil or water-glass.

(17) K. B. writes: Can you inform us of any better way of preparing leather to make cups for air pumps (3 inches diameter) than the following: We soak the leather in water until it becomes soft, then press it into moulds, and afterwards soak in neatsfoot oil for several days; but it will get hard, and shrink away from

the inside of the chamber and allow the air to escape? A. Make your cups as before, but use glycerine, with about one-third water, to soak the cups, and use glycerine as a lubricator. If the metal of the cylinder is hard the glycerine may answer your purpose. If soft or common brass, you may still have to use oil for a lubricator. A trial of a small quantity of pure plumbago, ground fine and mixed with glycerine, may give good results.

(18) P. J. D. asks: Can a regular heptagon be inscribed in a circle? If not, please to give the reason why. Is there any other polygon which cannot be inscribed? A. All polygons can be inscribed in a circle. The larger the number of sides, the more complex is the labor of laying out. For the drawing board, divide 360° by the number of sides required, and with this sum lay off the radial lines of the polygon with a sector, or from this sum and the radius, compute trigonometrically the chord of the arc of one side, which will be the actual length of the side in parts of the radius. For a heptagon the area=side²×3·6339136; the side=radius ×0·8677; the angle at the center=51° 25′ 42″; the angle of the sides upon each other=257° 08′ 36″; the angle of the side with the radius=128° 34′ 18″.

[OFFICIAL.]

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May 23, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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From May 16, 1882, to May 26, 1882, inclusive.

Alarm clocks, Jerome & Co., New Haven, Conn.
Bell alarm, F. N. Cottle, Boston, Mass.
Boots and shoes, S. E. Hindley, Worcester, Mass.
Cabinet, sewing machine, O. Fitzgerald, Fairfield, Me.
Ceilings, construction of, J. Budd, Boston, Mass.
Cotton press, S. B. Steers, New Orleans, La.
Darning last, G. A. Cochrane, New York city.
Door fastener, C. A. Crongeyer *et al.*, Detroit, Mich.
Dynamo-electric machine, W. A. Sterns *et al.*, New York city.
Electric battery, J. B. Wallace, Ansonia, Conn.
Electric motor, J. Kearney, San Francisco, Cal.
Engine, rotary, L. J. Wing, Washington, D. C.
Glove fastener, W. S. Richardson *et al.*, Newton, Mass.
Flour, manufacture of, W. Warren, Chicago, Ill.
Lead, manufacture of oxide of, G. T. Lewis, Philadelphia, Pa.
Link machine, R. D. Evans *et al.*, Washington, D. C.
Metal planer, J. Richards, San Francisco, Cal.
Pipes, steam, etc., J. L. Loo, New York city.
Power wheels, E. W. Merrill, Brooklyn, N. Y.
Sewing machine, G. Gowing, Oakland, Cal.
Sewing machine, A. A. Fisher, San Francisco, Cal.
Shoe uppers, machine for putting together, S. L. Wiegand, Philadelphia, Pa.
Telegraph apparatus, A. A. Knudson, Brooklyn, N. Y.
Telephone apparatus, C. E. Chiunock, Brooklyn, N. Y.
Wall paper, apparatus for drying, J. S. Warren, *et al.*, New York city.
Water conductor, G. K. Reber *et al.*, Pittsburg, Pa.